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PRINCIPLES OF SURGICAL PRACTICE

ABDOMINAL INCISIONS

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THE principles governing incisions through the abdominal wall are simple: (1) they must give ready access to the part to be investigated, and (2) they must not weaken the abdominal wall. These desiderata are best obtained by observance of certain rules.

Dealing with the muscles.

1. Whenever possible, muscles should be mobilized and displaced temporarily rather than cut.

2. If the muscles must be cut, they should be split in the direction of their fibers rather than cut across.

3. The rectus muscle deserves special consideration because of the peculiarities of its nerve supply and its investment by a fascial sheath.

The nerve supply of this muscle is segmental and comes from the lower six thoracic nerves. The muscle may, therefore, be cut transversely without impairment of its nerve supply such as would occur in most other skeletal muscles if treated in this way (Fig. 1).

The rectus sheath forms a fascial investment to the muscle. When the sheath has been opened, the muscle may be displaced medially or laterally; it is firmly fixed to its anterior sheath by the tendinous inscriptions, and, also, the outer part of the muscle is relatively fixed by the entrance of its nerve and blood supply in this region. The blood vessels and nerves may be mobilized sufficiently to give access to the abdomen along the whole outer border of the muscle. The inferior, or deep epigastric, artery crosses the outer border and reaches the deep surface of the muscle to which it is firmly adherent. Low incisions along the outer border of the muscle may divide this artery with its large venæ comitantes and cause furious bleeding. Retraction of the muscle inward must be carefully executed as there is no question but that postoperative thrombosis frequently owes its origin to forcible retraction with damage to these blood vessels.

4. Openings made by the incision through the different layers of the abdominal wall should as far as possible not be superimposed. The value of this dictum is well exemplified in the lateral rectus-displacing, or Battle, incision in which the incisions through the anterior and posterior rectus sheaths are separated by the intact rectus muscle (Fig. 2).

5. Materials for drainage should be inserted through separate stab incisions elsewhere, as their presence in the main wound may seriously prejudice the strength of the ultimate scar. This does not apply, of course, to drainage of the abdominal wall as distinct from drainage of the peritoneal cavity.

Dealing with the nerves.

1. The incision must divide no nerves. This is a counsel of perfection which can, however, usually be adhered to with the exercise of sufficient care. One or even two of the nerves of the rectus muscle may be divided and the abdominal wall not weakened. It is better, however, to take no risks in the matter as there is no problem in abdominal surgery more hopeless to deal with than the hernia which results from extensive paralysis of the abdominal muscles.

The main anatomical features concerning the nerves to the abdominal muscles are:

1. They are derived from the lower six thoracic and the first lumbar nerves.

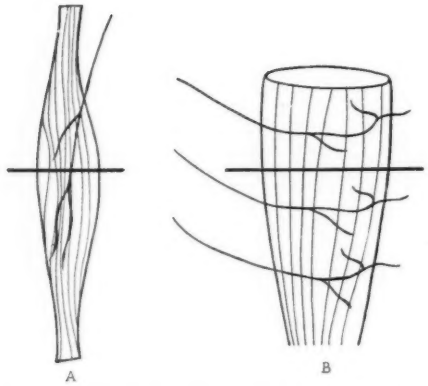

Fig. 1. A illustrates how a muscle innervated by a single nerve is injured by transverse section. B shows that a segmentally supplied muscle is not injured by this procedure.[1]

2. They run in the direction in which the hands are put in trousers' pockets, i.e., inward and downward.

3. They lie between the transversus abdominis and internal oblique muscles alongside the intercostal and lumbar arteries to the abdominal wall. They would be severely injured by any vertical incision through the abdominal wall placed lateral to the long axis of the rectus muscle which is not carried out in such a manner as to expose and protect the nerves (Fig. 3).

4. The nerve supply to the falx inguinalis, or conjoined tendon, is derived from a special branch given off by the ilio-inguinal nerve. This nerve is in danger in McBurney's exposure. It is best protected by performing this operation in a good light and by direct vision. Should the nerve be damaged, inguinal hernia will result, a complication which is well recognized to follow this exposure (Fig. 4).

Having given off this branch, the ilio-inguinal nerve becomes purely sensory and is destined for the skin of the inner part of the groin. It emerges through the subcutaneous or external ring. Here it should be secured as a routine measure and excised in all cases to be operated upon for inguinal hernia to avoid troublesome complications which follow its inclusion in scar tissue as a result of the hernial repair. It is accompanied by an invisible artery and therefore the divided nerve ends should be ligatured.

5. The seventh, eighth, and ninth intercostal nerves enter the rectus sheath from under the ninth costal cartilage in the region of the gall-bladder angle. The nerves are bunched together here and as they supply the upper half of the rectus muscle their integrity should be rigidly protected. They are in danger in the subcostal incision (Kocher) used for gaining access to the bile ducts. Their protection is best secured by the rigid observance of the rule that this incision should never enter the lateral flat muscles and should never be prolonged down along the outer border of the rectus muscle (Fig. 5).

The anatomy of the abdominal wall is of particular concern to the operating surgeon (Fig. 6). Commencing posteriorly at the vertebral column the abdominal parietes from back to front present the following regions, each of which differs entirely from its neighbor:

Region 1. The sacrospinalis muscle mass is a vertical column which has a segmental nerve supply. It does not concern the abdominal surgeon.

Region 2. At the outer border of the sacrospinalis muscle is found a dense fascia, the aponeurosis of origin of the transversus abdominis muscle. It is formed by fusion of the layers of the lumbodorsal fascia. A vertical incision from the twelfth rib to the iliac crest through this fascia would divide no muscle fibers (excepting those of the latissimus dorsi), but it would sever the following nerves: the subcostal, the ilio-inguinal, and the iliohypogastric. The result of such nerve division would entail serious weakening of the lower lateral abdominal wall, particularly in the inguinal hernial region.

Region 3. The area of flat muscles. The oblique, external, and internal muscles with the transversus abdominis form an extremely powerful muscle mass. The fibers of these muscles run as shown in Figure 7. The result of this arrangement is to secure elasticity together with great strength. Lying between the second and third of these layers (the internal oblique and transversus) are the vessels and nerves of the abdominal wall, so that this area may fittingly be termed the neurovascular plane. Incisions may be made anywhere through this region provided: (1) they are directed downward and inward in the direction of the external oblique, and (2) the flat muscles are split in the direction of their fibers.

This is well exemplified in McBurney's incision. When a larger opening is necessary all the muscles may be divided in the direction of the fibers of the external oblique without very seriously jeopardizing the integrity of the abdominal wall. This is the principle of the usual

[1]Illustrations by courtesy of John Wright & Sons, Ltd., Bristol.

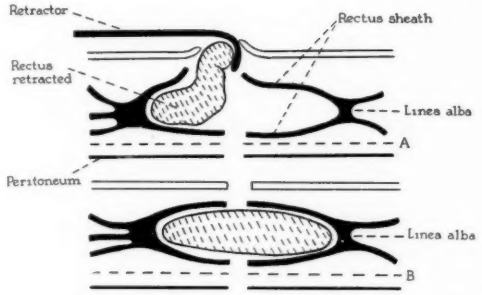

Fig. 2. How the openings through the rectus sheath are protected when the retracted muscle returns to its normal position.

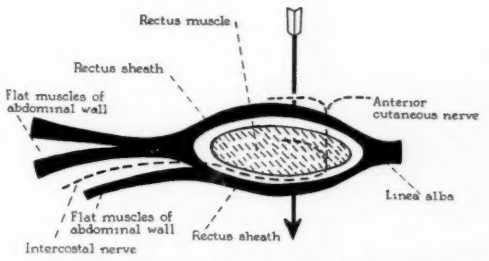

Fig. 3. How the rectus muscle may be denervated by incisions wrongly placed. Arrow denotes incision.

oblique kidney incision. Sir Harold Stiles taught and practiced an incision of this kind in cases of acute appendicitis.

Region 4. The linea semilunaris, i.e., the aponeurosis which replaces the lateral flat muscles at the outer border of the rectus. Vertical incisions through this region will paralyze the rectus muscle over a corresponding area as the vessels and nerves to the rectus muscle cross this line. Abdominal incisions are therefore, never made in the long axis of this region.

Region 5. This comprises the region of the rectus sheath and the rectus muscle. As the vast majority of abdominal incisions are made in relation to this area the region deserves special consideration. The rectus muscle is invested by a fibrous sheath which is very strong excepting over the lower 4 in. of the muscle where the posterior sheath is deficient. The muscle itself rises from a pointed lower attachment to the pubis and widens out gradually as it ascends to its attachment to the anterior surfaces of the fifth, sixth, and seventh costal cartilages. The fibers are vertical. The upper half of the muscle is divided into short segments by three tendinous intersections which attach the muscle firmly to its anterior sheath but not to the posterior sheath. Occasionally one of these intersections is found below the umbilicus. In spite of their fibrous nature many blood vessels come through these fibrous areas. The intersections are troublesome in mobilization of the borders of the muscle. Their presence divides a long muscle into several shorter segments with resulting greater contractile efficiency. The special anatomical features of the nerves to the rectus are dealt with elsewhere. The blood supply to the muscle is profuse, being derived from the superior and inferior epigastric arteries, and the lower intercostal vessels. All the arteries are accompanied by veins and they all enter the muscle on its deep surface. The inferior epigastric artery is particularly important. It crosses the outer border of the muscle 2 or 3 in. above its lower attachment where the vessel passes in a lateromedial direction to enter the rectus sheath and then usually courses vertically upward. On the deep surface of the muscle it makes numerous communications inside the sheath. It is accompanied by two large veins. The vessel is endangered by low incisions along the outer border of the rectus. Should its division be necessary this may be carried out without evil consequence. The artery and its veins are in much greater danger when the muscle is forcibly retracted inward, as branches are torn which not only give rise to troublesome bleeding but which may jeopardize the healing of the wound by the formation of hematomas. The risk of thrombosis and possible embolism has been discussed. Occasionally the inferior epigastric artery perforates the rectus muscle and may then be found on its anterior surface. The muscle may be safely dealt with by any of the following procedures:

1. It may be cut transversely. As the nerve supply is segmental this procedure does not damage nerves. It is wise to stitch the muscle to its anterior sheath above and below the proposed site of section. This prevents retraction.

2. The muscle may be split in the direction of its fibers, with regard to the manner in which the nerves enter the muscle (as already mentioned), but if the splitting is carried out for more than 1 in., the segment of muscle medial to the line of cleavage will be paralyzed. This is not a disadvantage when not more than ½ in. of muscle is medial to the cleavage; in fact there is the advantage that the wound may be more securely closed as far as stitching up the anterior sheath is concerned.

3. The muscle may be mobilized along the whole length or any lesser extent of its inner

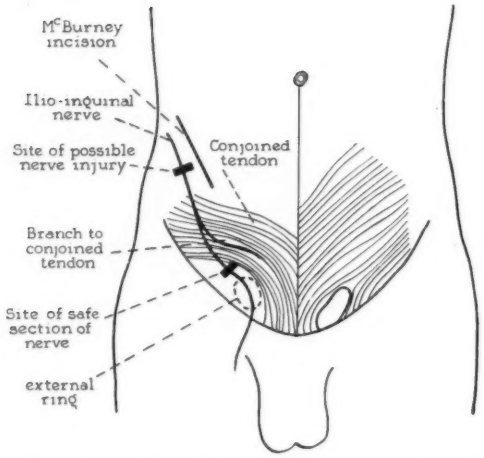

Fig. 4. Proximity of the ilio-inguinal nerve to McBurney's incision. Observe branch to falx inguinalis (conjoined tendon).

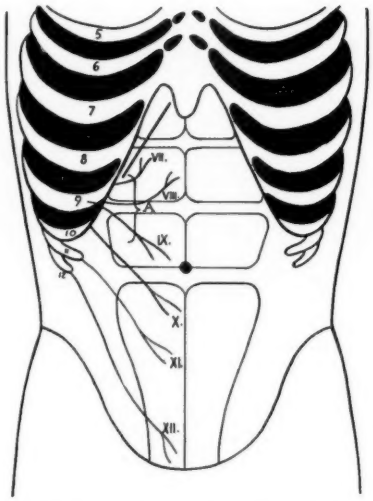

Fig. 5. The seventh, eighth, and ninth intercostal nerves are entering the rectus sheath from beneath the ninth costal cartilage. Black bar shows Kocher's incision (drawn too short). Prolongation of the lower end of the incision would sever the seventh nerve. Further prolongation would divide the eighth and ninth nerves and paralyze half of the rectus. A is the seventh, eighth, and ninth intercostal nerves bracketed together.

border. This is the commonest of all abdominal incisions. The incision is made about ½ in. lateral to the inner rectus border and the anterior sheath is then dissected off the muscle. This is a little tedious so that many surgeons prefer to split the muscle.

4. The outer border of the muscle may similarly be mobilized in its whole length with regard to the very special precautions, dealt with on pages 527 and 528, to conserve the nerve supply. In displacing the muscle inward or outward the principle of so planning the incision that after closure of the wound the intact rectus muscle intervenes between the incisions through the anterior and posterior sheaths should invariably be observed.

Region 6. This is the linea alba. Above the umbilicus it is ½ in. wide. Below the umbilicus it is merely a line. The fibers of the rectus sheath run transversely. Vertical incisions through the linea alba weaken the abdominal wall by virtue of the fact that there is no muscle to protect the subsequent scar. Seventy-five per cent of the cases of "burst" abdomen involve midline subumbilical incisions.

To summarize this section, Region 1 is not invaded by abdominal surgery; Regions 2, 4, and 6 are not suited to vertical incisions; Region 3 permits of grid-iron incisions anywhere; through-and-through incisions may be made in the line of the fibers of the external oblique muscle, such as practiced in the usual incisions to expose the kidney; and Region 5 is the most common area of access.

The principles which should govern abdominal incisions become very simple, then, when it is realized that only two of the regions of the abdominal parietes may with propriety be attacked in gaining access to the peritoneal cavity. The purely fibrous regions should never be divided vertically. The area of the flat muscles may be penetrated preferably by the grid-iron method, but when essential by through-and-through incisions which may be as long as necessary. For example, Professor Gray Turner advises that tumors of the ascending or descending colons may be excellently exposed by such incisions made directly over the mass. I remember seeing Professor Hugh Cabot expose a gargantuan hypernephroma of the kidney by such an incision, which had novel features; it commenced at the tip of the tenth rib and extended straight to the umbilicus; it split the flat muscles and cut the rectus transversely. No nerves were damaged. When further access was necessary a paramedian incision was extended from the costal margin to the umbilicus. This is a good demonstration of the manner in which adequate

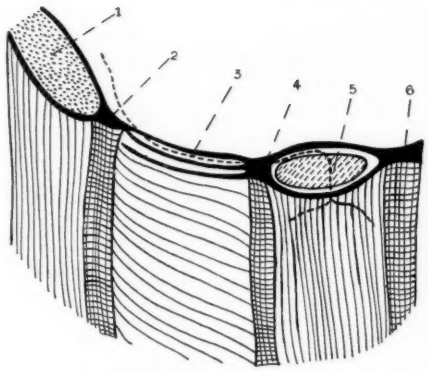

Fig. 6. Diagrammatic representation of the right half of the abdominal parietes. Observe how three muscle columns alternate with three purely fibrous areas. Area 1, sacrospinalis; Area 2, fibrous; Area 3, flat muscles; Area 4, aponeurosis of flat muscles (linea semilunaris); Area 5, rectus in sheath; Area 6, linea alba. The dotted line shows the anatomy of the intercostal nerves.

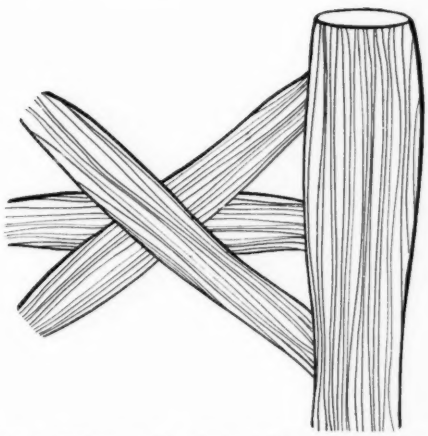

Fig. 7. Diagrammatic representation of the direction of the fibers of the lateral flat muscles, the external and internal obliques, and the transversus abdominis, in that order, from superficial to deep. The vertical column is the rectus.

access may be obtained by a combination of incisions, with strict adherence to the anatomical principles which have been enunciated. So a vertical incision near the midline may be combined with a transverse splitting of the rectus muscle, or both recti may be transversely divided. I have seen transverse incisions cut across both the anterior and posterior sheaths and the muscles themselves left intact. Combined thoracic and upper-abdominal access may be obtained by an incision in the seventh, eighth, or ninth intercostal space which transects the costal margin and extends through the rectus or the flat muscles, as the case may be, in line with the original incision. Incisions which increase the abdominal opening by mobilization of the costal margin, e.g., Marwedel's maneuver, are, in my experience, so unsatisfactory as not to warrant their use.

The realization of these principles set forth enable correct incisions to be made through any part of the abdominal wall (Fig. 7a). It may, however, not be out of place to particularize on some of the common exposures:

The approach to the gall bladder.

1. This may be made by vertical, rectangular, or oblique incisions (Fig. 8). The vertical incision is the usual paramedian one. The rectus muscle may be dealt with either by dissecting its anterior sheath and retracting the intact muscle outward, or by splitting the muscle in the direction of its fibers ½ in. from its inner border. Although the latter procedure is quicker the former is more correct. This exposure presents the indubitable advantage that it may be extended to any length, and, thus, the appendix may always be dealt with and, so too, any co-existent lesion of the stomach, or duodenum. It is, however, associated with unavoidable handling of the stomach, colon, and small intestine, which is inevitably followed by shock and adhesions. The latter are frequently productive of unpleasant sequelæ of the type which follow direct adhesions of viscera, especially the stomach, to the anterior abdominal wall. I have abundant evidence that these adhesions are a common cause of the continuance of dyspeptic symptoms following operation through the high paramedian incision.

2. The rectangular incision is merely the paramedian incision combined with transverse division of the rectus muscle. It is used when the vertical incision gives insufficient access.

3. The oblique incision is associated with the name of Kocher. It is essentially a transection of the rectus muscle below and parallel to the costal margin. Whether the incision is ½ or 2 in. from the costal margin varies with the habitus of the patient, it being higher in hypersthenic and lower in hyposthenic persons, in accordance with the varying position of the lower border of the liver in such cases. No other incision made with regard for the subsequent integrity of the abdominal wall gives such good access. Moreover, it presents the enormous advantage that only a small part of the stomach comes into the field of operation. The gut is immediately packed off

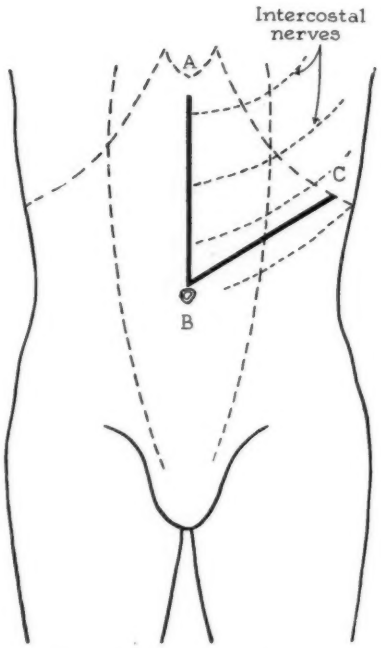

Fig. 7a. How extensive access may be obtained by combining a vertical incision (AB) with an oblique incision (BC). No nerves are injured.

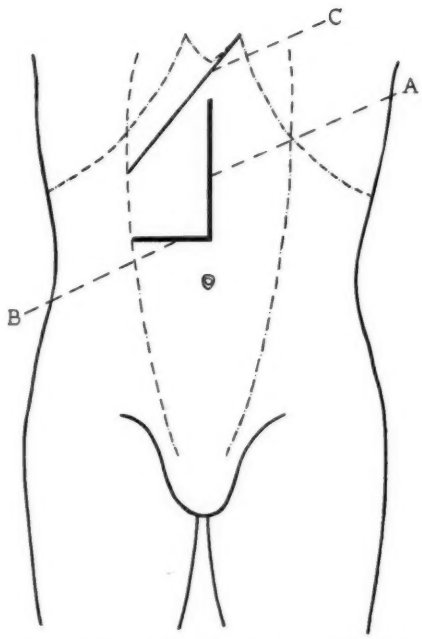

Fig. 8. Incisions for exposure of the bile passages. A, Vertical incision. It is more sound if placed to the right of the midline. B, Incision A combined with transection of the rectus. C, Kocher's subcostal incision.

and there is, therefore, a minimum of handling. This incision in no way impairs the integrity of the abdominal wall if the muscle section ends at the outer border of the rectus. As originally described the incision was continued down through the linea semilunaris for 1 in. or more (Region 4). If this is done several of the nerves to the rectus muscle will certainly be divided with resultant paralysis. This is a tragedy as it does not admit of operative repair. The rule should be absolute, then, that the incision should extend no further laterally or downward than the outer border of the rectus muscle. It may be just noted that the transversus abdominis muscle extends behind the rectus in a medial direction for half the breadth of the rectus sheath in many cases. It may be divided with impunity. A considerable disadvantage of this incision is that in many cases it does not permit of removal of the appendix or of the carrying out of any procedures other than those on the liver and bile passages. It is, however, better to make a second incision rather than to extend the subcostal incision at its outer end.

Exploratory incision. This is a right paramedian incision at the level of the umbilicus. Most areas of the abdomen excepting the most lateral may be reached through paramedian incisions placed to one or the other side of the umbilicus, and a left paramedian incision is the commonest one used for splenectomy. How access may be improved has been indicated. All the gynecologist's abdominal work may be carried out through a right or left paramedian incision extending from the pubis upward for the requisite length. The disadvantages of the midline incision have been explained.

Access to the appendix. As appendicectomy is so very much the commonest of all abdominal operations, the methods of access deserve attention. There are three incisions in general use: the McBurney or muscle-splitting, the Battle or pararectal, and the paramedian.

1. The McBurney incision is placed with its center at the junction of the lateral with the middle third of the right spino-umbilical line. It is made in the direction of the fibers of the external oblique muscle and is vertical to the line

mentioned, which is at the midpoint of the incision. The external oblique muscle is split in the direction of its fibers, the internal oblique and transversus abdominis muscles being similarly split in the direction of their fibers. The peritoneum is divided in the direction of the skin incision. The incision is a valuable one when an exact diagnosis can be made even in regard to the position of the appendix. It shortens convalescence. It has been found to have the following disadvantages:

a. The ilio-inguinal nerve (nerve to the falx inguinalis) is often seen and may be damaged with later development of inguinal hernia.

b. If the incision requires enlargement it loses its advantages as the abdominal wall is weakened. It may be enlarged by dividing the linea semilunaris and the outer part of the rectus sheath in a transverse direction and retracting the rectus inward. In these cases not only do the incisions through the fascial structures disseminate infection but forcible retraction must often be resorted to with increased trauma to the bowel and generally with the infliction of surgical insult. The statement that the operator who cannot remove every appendix through the McBurney incision should not practice surgery is unworthy of the great and deservedly famous institution where I heard the remark made.

2. The pararectal incision is made exactly as the McBurney, but it is centered at the junction of the inner with the middle-third of the right spino-umbilical line. In practice it is often made at a lower level, to avoid the lowest tendinous inscription of the rectus muscle and to give access to the pelvis. The anterior rectus sheath is cut 1 in. medial to and parallel with the outer border of the muscle. The sheath is dissected laterally off the muscle, the latter retracted in, and the posterior sheath and peritoneum are divided in the same line as the anterior, great attention being paid to the nerves of the rectus. The incision is valuable in that it may be extended for any length and because the subsequent scar is sound. If prolonged too far downward the inferior epigastric vessels will be cut. The incision becomes a weak one if drainage material is inserted through it into the peritoneum as the rectus muscle is prevented from occupying its normal position and protecting the scars in the anterior and posterior layers of the sheath. Stab drainage should be used (Fig. 9).

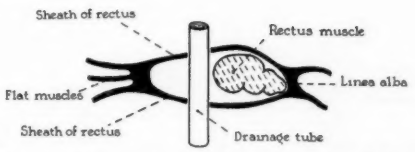

Fig. 9. The manner in which through-and-through drainage of the abdomen weakens the abdominal wall by preventing muscle replacement

3. The paramedian incision is used when the diagnosis is in considerable doubt.

ABSTRACTS OF CURRENT LITERATURE

SURGERY OF THE HEAD AND NECK

HEAD

Kazanjian, V. H., and Converse, J. M.: Reconstruction After Radical Operation for Osteomyelitis of the Frontal Bone: Experience in 18 Cases. *Arch. Otolaryngol.*, 1940, 31: 94.

Since 1931 a radical operation for osteomyelitis of the frontal bone has been used routinely at the Massachusetts Eye and Ear Infirmary. The adoption of this radical operation has greatly diminished the mortality from the disease. However, it has created another problem, namely that of the deformity. The authors describe their experiences with 18 patients who had been referred to the plastic service of the Massachusetts Eye and Ear Infirmary for repair of the deformity. Eleven were males and 7 were females. The ages ranged between eight and forty-four years. Fourteen patients, or approximately 75 per cent, were under the age of twenty-five. Eleven patients, or approximately 60 per cent, were under the age of twenty-one.

The problem of plastic closure revolves about the patient with a large gaping wound in the forehead. A large area of dura lies uncovered and unprotected by bone. The problem from a plastic point of view is therefore twofold: first, that of closing the defect in the soft tissue by an approximation in proper position of the skin flaps; and second, that of replacing the absent bone. The type of incision which is made at the time of the initial operation for the removal of the osteomyelitic frontal bone necessarily has a bearing on the secondary plastic operation. The primary object of the cutaneous incision is the proper exposure of the frontal bone. However, in the process of repair, objections were found to certain types of incision. Following experimentation, the most suitable incision for exposure of the frontal bone was found to be the inverted T incision above the eyebrows, with rounded angles.

a b

Fig. 1. a, patient with large, gaping wound in the forehead, following the removal of a large section of the frontal bone. b, patient after closure of the wound, fourteen days after operation.

When the resection of the frontal bone has been accomplished, using this most favorable cutaneous incision, the question arises as to how soon the first stage of plastic repair, or closure of the soft tissues, may be performed. The authors believe that the plastic closure should not be performed until all suppuration and sequestration have ceased and the wound has become filled with healthy granulations. An excellent index of the time to operate is the presence of a thin layer of newly formed epithelium covering most of the granulations. This process usually takes from two to three months. If the wound is closed at an earlier period it is impossible to be sure that all suppuration and sequestration have ceased entirely.

The first stage of the plastic repair, closure of the defect in the soft tissue, consists in bringing down the skin flaps from their position curled up over the edges of the bone to their original site. It is carried out in the following successive stages: (1) the skin flaps are dissected away from the dura and the surrounding bone; (2) the thin layer of new epithelium is shaved off with a knife; (3) to break the pull of the deep layer and to permit liberation of the flap, a series of crisscross incisions is made with the knife through the subepithelial tissue; and (4) the flaps are then drawn down into their original position and sutured with the finest silk sutures after careful trimming of the edges. Finally a mildly compressive dressing is applied.

After this plastic closure the appearance of the patient is considerably improved. There is still, however, noticeable deformity because of the absence of bone. From the front of the face a depression can be seen. Under the skin, pulsations of the brain can be perceived, which are felt distinctly by the patient. In profile, flattening of the frontal region gives the patient a peculiar "birdlike" appearance. Moreover, the patient is haunted by the thought of possible injury and in most cases wears a protective headpiece over the defect in the bone. The extent of the deformity is naturally directly related to the amount of frontal bone removed and to the height of the forehead. The defect in the frontal bone is irregularly quadrilateral and varies from 7 to 12 cm. in width and from 6 to 10 cm. in height.

That bony regeneration is remarkably active in children is confirmed by the complete obliteration of the frontal defect in 2 children. In the 16 other cases of this series no regeneration of bone was found. Judging from the experience gained in this series, it

a b c d e

Fig. 2. a, wound of three months after resection of the frontal bone. b, skin flaps dissected back, exposing the surrounding bone; superficial epithelium incised. c, epithelium dissected over the layer of granulations covering the dura. d, incisions carried through subepithelial tissue to permit extension of the skin flaps. e, skin flaps sutured into position, with drains in place.

appears that it is impossible to rely on spontaneous regeneration of bone and that the bone must be replaced by operative measures. Osteoperiosteal grafts appear to be most practical, because they are easy to obtain and become joined to the adjacent bone to form a continuous protective bony covering. Grafts have been obtained from the scapula, the ribs, and the ileum, but the most satisfactory source is the tibia. Easily accessible, the tibia yields the large flat grafts that are needed to repair large defects.

In 4 of this series of 18 cases, bone grafting was carried out. In 2 cases of children, the patient presented complete regeneration. In the 12 other cases, either the patient did not care to undergo an additional operation, or sufficient time had not elapsed at the time of writing for the operation to be performed. In all cases sufficient time was allowed to permit bony regeneration, the period between the closure of the soft tissues and the bone grafting having been from twelve to eighteen months. The operation for transplanting bone to the frontal defect has been performed under general anesthesia, under local anesthesia, and under a combination of both general and local anesthesia.

Incisions are made through the scars in the frontal area, and the flaps are dissected away from the dura until the edges of the surrounding bone are encountered. The periosteum covering the surrounding bone is elevated, and the bony edges are freshened with a rongeur. Careful hemostasis of the wound is then carried out. An incision is made medially to the crest of the tibia to expose its inner aspect. The length of the incision is determined by the length of the graft to be removed. In certain cases one wide graft is sufficient, but generally two are necessary. Each graft is fractured into the proper curvature to reproduce the natural contour of the forehead. The grafts are then introduced and placed in proper position. The skin flaps are sutured and a mildly compressive and immobilizing dressing is applied. The appearance of the patient approaches that of a normal person. In order to gain further cosmetic improvement in some cases it has been necessary to add pieces of cartilage over the eyebrows and frontal eminence.

The possibility of convulsions following the plastic repair, due to adhesions between the dura and the skin or the grafted bone, has been considered. Epilepsy as a sequel of osteomyelitis was observed in 3 of the 18 patients. In all 3 cases the convulsions occurred before the plastic operation and could not be attributed directly to the latter procedure. In addition, the 3 patients presented evidence of intracranial complications at the time of their first admission to the hospital.

NOAH D. FABRICANT, M.D.

a b c d

Fig. 3. a, patient six months after resection of the frontal bone. b, patient after plastic closure of the skin flaps; the depression is due to the absence of bone. c and d, patient after bone grafting; restoration of the normal contour of the forehead.

Søbye, P.: The Treatment of Fracture of the Corpus Mandibulæ ad Modum Ipsen. *Acta. chirurg. Scand.*, 1940, 83: 445.

Ipsen's method of treatment of a fracture of the corpus mandibulæ is the introduction of Kirschner's steel needles for wire extension through the fragments after reposition. In this article, Søbye reports on about 25 cases treated with this method in various hospitals and clinics in Sweden and Denmark. He has compiled a detailed table of these cases and also tabulated them in brief case records.

The principle of the method of treatment consists first in reposition of the fracture so that the teeth articulate naturally. In case there are no teeth, or such are defective, reposition of the fracture must be performed in the best possible way before the insertion of Kirschner's needles. Such needle, or needles, are best inserted percutaneously. The best procedure is to employ an electric drill, as the fragments then are fixed in the correct position by means of the left hand and the drill is manipulated by means of the right hand. The risk of injuring the alveolar inferior nerve and the roots of the teeth is diminished when the electric drill is used. Ether anesthesia, a slight ethyl-chloride anesthesia, or local anesthesia can be used, according to the nature of the case. When only the fracture of the mandible has to be considered, local anesthesia is generally used. Most frequently no dressing is used, or corks are placed on both ends of the needles. Before drilling the needle, a small incision should be made at the point of insertion. As a rule, the patient is able to move the jaw without any pain immediately after the insertion of the needle, and he is able to speak without any inconvenience and to eat and chew light food. However, fluid or semi-fluid food is recommended for the first few days. A mouth wash is of great importance. The needles remain for four weeks. The patients with less severe cases can be discharged after a few days in the hospital and continue treatment as outpatients, provided that they are frequently controlled.

All the cases reported were complicated to involve the cavity of the mouth; and 3 cases, the skin also. In 12 patients the fractures of the jaws were complicated by other severe lesions. The complication of infection does not play so great a part as may be imagined when one considers that all of the cases were complicated to involve the cavity of the mouth.

The operation has the great advantages of being simple, it lasts only a few minutes, and it can be performed by any surgeon. The disadvantages are that it is sanguineous and that a foreign body is passed through the fracture, as infection may be present if the cavity of the mouth is involved.

EMIL C. ROBITSHEK, M.D.

Meng, C. M.: Tuberculosis of the Mandible. *J. Bone & Joint Surg.*, 1940, 22: 17.

Tuberculosis of the mandible is considered a rare disease. The author reports 14 cases in seventeen and one-half years observed at the Peiping Union Medical College Hospital. Only 5 were diagnosed clinically, and 1 as a probability, while 8 were diagnosed as chronic suppurative osteomyelitis. Three were diagnosed roentgenologically, 1 as a probability and 10 as osteomyelitis.

Chapotel described 4 clinical forms of tuberculosis of the mandible:

1. The superficial or alveolar form
2. The deep or central form
3. The diffuse form
4. The acute osteomyelitic form

Operative treatment consists of incision and drainage, sequestrectomy, and partial osteotomy.

Of the patients seen in this series, 43 per cent had tuberculous lesions in other bones. In 10 cases in which the chest was studied, there was evidence of pulmonary or pleural tuberculosis. The writer believes that tuberculous infection of the mandible is almost always hematogenous. Rational therapy must emphasize general anti-tuberculous measures in addition to local treatment of the tuberculous lesion in the mandible. DANIEL H. LEVINTHAL, M.D.

Bauer, W. H.: The Importance of the Histological Picture of Osteomyelitis of the Jaws Following the Extraction of Teeth for Treatment. *Am. J. Orthodont. & Oral Surg.*, 1940, 26: 150.

Since the mouth cavity is never free of microorganisms, acute and chronic inflammatory changes occur in the supporting bone around the root end following tooth extraction. This must be considered as a localized osteitis.

The undisturbed healing of extraction wounds corresponds, on the whole, to tissue changes in bone repair, or in the organization of a blood clot traumatically produced in the bone. The presence of an epithelial wound and the fact that more or fewer remnants of the periodontal membrane remain within the socket, give the healing of extraction wounds a particular note. The importance of a rapid, undisturbed, and complete epithelization of the surface of the non-infected extraction wound, to protect the regenerative processes, should be emphasized.

More attention should be called to acute or chronic bacterial periapical infectious disturbance of healing after tooth extraction since this disorder may give rise to the development of osteomyelitis of the jaws. A dry socket may be looked upon as a circumscribed osteitis of the alveolar bone with death of bone and formation of small sequestra. The immediate cause for the condition is the invasion of the socket by pathogenic micro-organisms.

Acute infectious periapical inflammation is characterized by the development of a typical osteitis with predominating osteoclastic resorption of the surrounding bone because of the presence of a hyperemia with edema in the adjacent tissues. The surrounding bone marrow is involved rapidly, contains hyperemic blood vessels and masses of polymorphonuclear leucocytes, and shows a widening of its spaces because of osteoclastic resorption of the bone

trabeculæ. Later, suppuration occurs within the spongy bone and fills the bone marrow spaces with pus. This process must be considered as a localized osteitis or osteomyelitis from the standpoint of the pathologist, although clinically such cases are usually benign.

The infected gangrenous pulp is a continuous source of various micro-organisms, and the periapical region of chronically infected teeth harbors, in the majority of cases, streptococci and sometimes staphylococci. A chronic periapical inflammation may become acute by an increase of the virulence of the bacteria, or by other factors which prevent a further discharge of the exudate or weaken the defence mechanism. The extraction of teeth so infected may propagate a spread of the infection as a result of the uncovering of bone marrow spaces and blood vessels.

There can be no doubt that the mandibular canal is an anatomical pathway for infection. The infection, entering the mandibular canal, involves the inferior alveolar nerve, and causes a perineuritis and endoneuritis which may lead to complete destruction of the nerve. Regenerative changes of the nerves develop simultaneously with the degenerative ones, which explains the most remarkable symptoms of jaw osteomyelitis: the hyperesthesia of the lip and cheek first, followed by hypo-esthesia and the complete restoration of the sensitivity after healing.

Because of the mandibular canal, osteomyelitic processes have a better chance of spreading in the mandible than in the maxilla; however, because of the distribution of cancellous and compact bone, the resistance to osteomyelitic processes is greater in the mandible than it is in the maxilla. The large nasal and sinus cavities of the maxilla weaken the firmness of this bone against a destructive process, but the epithelium lining these cavities constitutes a fairly good barrier.

The bone deposits in the involved area and especially around the sockets, in spite of a destroying process, must not be disturbed by treatment, which should be conservative. It is for this reason that the jaws must be immobilized. The dentist has to splint the remaining teeth by the simplest method in cases of jaw osteomyelitis. To attain the best results the appliance should be extended to all the teeth of the jaw. This immobilization will support the rebuilding of bone and will help to prevent a rapid extension of the process.

The demarcation of the dead bone develops slowly, and the dentist must wait patiently for its sequestration or its spontaneous elimination. The sequestrated bone, fully detached from the surrounding bone and controlled by roentgenograms taken at definite intervals, can be removed cautiously without any great surgical interference.

Sufficient drainage should be established and maintained until the sequestrum is eliminated. This treatment is particularly important if the osteomyelitic process is accompanied by a cellulitis involving the mouth floor or neck. Even though the osteomyelitic process ceases, the suppuration of the soft tissues may develop further, so that the phlegmonous infiltration becomes independent of the osteomyelitic process.

The best treatment for osteitis is patience.

SAMUEL KAHN, M.D.

Payne, R. T.: Pneumococcal Parotitis. *Brit. M. J.*, 1940, 1: 287.

Pneumococcal parotitis is a clinical entity possessing many characteristic features. It may occur in an acute, recurrent, or chronic form. Bacteriologically the largest number of cases of pyogenic parotitis is caused by the staphylococcus aureus, which gives rise to the acute disease; the second largest number is caused by the streptococcus viridans, which gives rise to the typical recurrent condition; the third largest number is due to the pneumococcus, and this group possesses features of both the acute and the recurrent disease. The pneumococcal group is the least well recognized of the three main types of pyogenic parotitis. The recognition of the bacteriological type of the disease has important bearings upon the prognosis and therapy.

A series of 17 personal cases of pneumococcal parotitis is reviewed. Etiologically the importance of dental factors is stressed. The recurrent cases may start during infancy, during the period of second dentition, or during the first half of adult life. The recurrent cases tend to be commoner in women. The main pathological features are described, and the uncertainty of the course and the tendency to abscess formation are stressed. The largest group is the recurrent one, with some overlap of the other groups into this. The acute cases never pursue as fulminating a course as do some of the staphylococcus-aureus cases. In the recurrent group the exacerbations tend to be more acute and more severe than those in the streptococcus-viridans cases, and at times pass unexpectedly on to suppuration within the gland and marked constitutional disturbance.

Suppuration and fistula formation are the most likely complications. In the recurrent cases the parotid saliva is characteristically profuse and tenacious and contains pus and much mucus. Prognosis is good as to life. Treatment may require one or more of the following measures: massage of the gland, duct catheterization, heat, mouth washes, solid diet, drainage and duct operations, chemotherapy, and irradiation. JACOB M. MORA, M.D.

EYE

Livingston, P. C., and Walker, H. M.: A Study of the Effects of Liquid Mustard Gas upon the Eyes of Rabbits, and of Certain Methods of Treatment. *Brit. J. Ophth.*, 1939, 24: 67.

A carefully controlled series of observations upon the effect of mustard gas on rabbits' eyes is reported, together with the effect of various treatments for inhibiting the damage to the cornea. If it were possible, immediately after exposure, to irrigate the eyes

thoroughly, some benefit might be derived. However, the action of the mustard gas as such ceases after fifteen minutes, probably because of oxidation. A special irrigating speculum is described, which is to be used, when possible, very soon after exposure. Sodium bicarbonate (2 per cent) seems as good as any other lotion for this purpose. Atropine to minimize iris irritation, antiseptics such as merthiolate, and cod-liver-oil are of value. Oil instilled before exposure seemed to spread the destructive action of the mustard gas. Saturation of the system with ascorbic acid, given intravenously, had a marked effect in limiting corneal and lid inflammation.

SAMUEL A. DURR, M.D.

Yudkin, A. M., and Geer, H. A.: An Investigation of Experimental Cataracts in the Albino Rat: Clinical Implications. *Arch. Ophth.*, 1940, 23: 28.

Notwithstanding the amount of accumulated literature and the clinical and laboratory data, the causative factors of cataract formation remain an enigma. After a vast amount of experimentation with lactose and galactose diets to determine their effect in producing cataract in albino rats, the authors summarize their findings as follows:

The albino rat is susceptible to lenticular changes as a result of lactose feedings (high levels), or galactose feedings (lower levels). It is now possible to study the formation of opacities in the lens under carefully controlled conditions. It is apparent that a low protein ration hastens the development of the opacities of the lens and that a high protein ration may retard it; a high intake of cystine also tends to retard the pathological change. Dinitrophenol given in large doses does not produce lenticular changes in animals, nor does it aid in the formation of cataract. Massive doses of riboflavin and liberal amounts of Vitamin-B complex in the form of brewers' yeast powder exert no protective action against the development of galactose cataract in rats. When a lens has become completely opaque (mature cataract) in the rat as a result of the afore-mentioned methods, no specific dietary factor or local medication has been found that will change the opaque lens to its former transparent state. It is possible, however, to check the early development of lenticular changes by altering the diet. When early changes are observed in man he should be instructed (1) in personal hygiene, (2) to eat a well-balanced diet, (3) to correct gastro-intestinal dysfunctions, and (4) to adjust vascular decompensations. LESLIE L. MCCOY, M.D.

Gradle, H. S., and Snydacker, D.: Retinal Detachment in Primary Glaucoma. *Am. J. Ophth.*, 1940, 23: 52.

In this article 3 cases of retinal detachment occurring in glaucoma in which the intra-ocular tension had been lowered by miotics are reported. It states that a review of the literature reveals the rarity of this complication and reviews the theories of retinal detachment with an effort to correlate their importance in these cases.

The occurrence of retinal detachment in a pre-existing glaucoma is very infrequent.

Theories as to the pathogenesis of idiopathic retinal detachment can be roughly divided into two classes; namely, (1) those which hold that the primary pathology is in the retina, and (2) those which ascribe the major rôle to the vitreous. The chief modern proponents of the theories falling in the first group are Vogt and Weve, who, though their views differ somewhat, believe that cystic degeneration of the retina is responsible for the formation of holes, and that the detachments result after the hole has been formed. Hanssen ascribed dehiscences in the retina to myopic stretching. Congenital weakness has been mentioned as a cause. The theorists who consign the primary pathology to the vitreous are Gonin, Lindner, and Arruga, who all believe that the traction of a degenerated or detached vitreous is responsible for the origin of tears in the retina and the subsequent detachment.

It is almost universally agreed now that no one theory as to the pathogenesis of retinal detachment applies to all cases, that in some cases one or another factor may be responsible, and in other cases a combination of factors may be the cause. It is a well-known fact that in cases of glaucoma sections of the retina show marked degenerative changes. Marked cystic changes and local areas of chorioretinitic adhesions are frequently seen. On the other hand, there is no evidence as to the condition of the vitreous in cases of either primary or secondary glaucoma. A study of the vitreous in cases of glaucoma was attempted in the hope that some light might be thrown on this subject.

As a result of these clinical studies, no definite statement can be made as to the condition of the vitreous in cases of glaucoma which would throw any light on the cases reported here.

LESLIE L. MCCOY, M.D.

Gifford, S. R., and Cushman, B.: Certain Retinopathies Due to Changes in the Lamina Vitrea. *Arch. Ophth.*, 1940, 23: 60.

In this article the authors bring out the importance of seriously considering hyaline deposits of the lamina vitrea instead of ignoring them as being harmless and having no influence on vision.

They summarize their findings as follows:

Hyaline deposits of the lamina vitrea, known as drusen, may, when especially large or densely packed, cause a form of central retinopathy.

This is due apparently to pressure on the visual cells or to slight changes in their locations. Hence, the visual damage is usually much less than that due to primary cystic degeneration of the retina. The picture is the same whether it occurs in the hereditary form known as Tay's or Doyne's guttate chorioiditis or in the form affecting isolated members of a family. The conception of a senile or presenile degeneration of the membrane fitting into Treacher Collins' group of abiotrophies seems to explain the condition as well as any other.

Such deposits are to be distinguished from Gunn's dots which, whatever their nature, are located in the inner layers of the retina and cause no visual disturbance.

Dense aggregations of hyaline deposits in the macular area are associated with central disc-shaped retinopathy in a larger proportion of cases than is to be explained by mere coincidence.

This association is taken to indicate one manifestation of more extensive degenerative changes in the lamina vitrea, which seem to form the most important cause of the changes observed clinically.

A case of angioid streaks associated with central retinopathy and hyaline deposits is reported.

LESLIE L. MCCOY, M.D.

PHARYNX

McMyn, J. K.: The Anatomy of the Salpingopharyngeus Muscle. *J. Laryngol. & Otol.*, 1940, 55: 1.

The salpingopharyngeus muscle is generally regarded in modern text books of anatomy as an independent muscle, but usually it is given only a meager description. The author has dissected 6 specimens and presents the results.

In all dissections the muscle was found to arise by small slips of muscular and tendinous fibers from the apex of the medial cartilage of the tube. In all cases it was closely attached by fibrous tissue to the whole lower border and medial wall of the tube and the bone above. Its fibers blend lower down with the anterior or middle fibers of the palatopharyngeus muscle, and with these in 4 cases formed a separate and distinct salpingopharyngeal fold covered with mucous membrane. No connection was formed in either case with the levator palati muscle. The blood supply is obtained from the ascending palatine branch of the facial artery. It was not possible to isolate the nerve supply but it is very likely that it comes from the pharyngeal plexus.

The action of the salpingopharyngeus muscle is to aid the constrictor muscles and the stylopharyngeus muscle in raising the walls of the pharynx during deglutition. It does not of itself have much effect on the patency of the eustachian tube but probably acts as a synergist with the other muscles affecting the tube by slightly dilating the pharyngeal orifice. The eustachian tube is opened mainly by the tensor palati muscle; other muscles may act synergistically. The closing is probably passive, aided by the elasticity of the cartilage. The tube may vary individually, in some cases being open, in others shut by mucus.

JOHN DELPH, M.D.

Grodinsky, M.: Ludwig's Angina, Retropharyngeal Abscess, and Other Deep Abscesses of the Head and Neck. *J. Am. M. Ass.*, 1940, 114: 18.

Many of the less common spreading infections of the head and neck are of a serious nature because of their tendency to spread along fascial planes and invade the thorax, with the production of mediastinitis. In order to clarify certain points in regard to the fasciæ and fascial spaces involved, the author studied these structures in 95 adult cadavers and 4 fetuses.

The numerous fascial layers and potential interfascial spaces are described in detail. The probable routes of spreading infections are pointed out.

The clinical application of the knowledge of these fascial layers and spaces is discussed with regard to the best approach for drainage of the various spaces. A retropharyngeal abscess located between the pharyngeal wall and the alar fascia is best drained through the mouth. The abscess may extend laterally and inferiorly to the superior mediastinum, in which case external drainage along the anterior border of the sternocleidomastoid muscles becomes necessary. If the abscess ruptures into the space between the alar and prevertebral fasciæ cervical mediastinotomy is imperative, provided the abscess remains above the fourth cervical vertebra. If the infection spreads below this point dorsal mediastinotomy offers the only hope of saving life.

If infection from Ludwig's angina extends from the latera' pharyngeal space to the space between the pharyngeal wall and the alar fascia, or between the alar fascia and the prevertebral fascia, the measures already mentioned become necessary.

The space between the prevertebral fascia and the cervical vertebræ is of clinical significance chiefly in tuberculous abscesses of the spine.

Abscesses of the lateral pharyngeal space are best drained through a T incision in front of the sternocleidomastoid muscle and below the angle of the jaw, the submaxillary gland being displaced.

Submandibular space abscesses are most effectively drained by midline vertical incisions, or transverse incisions below the body of the mandible. Collections in the submental region require a midline incision, but often lateral incisions are necessary also.

LUTHER H. WOLFF, M.D.

NECK

Malcolm, R. B., and Benson, R. E.: Branchial Cysts. *Surgery*, 1940, 7: 187.

The authors report 2 cases of branchial cysts of the cervical sinus, and present a review of the literature. They discuss the embryology of the branchial region and the theories of formation of branchial cysts, in an attempt to differentiate the true branchial cysts from branchial cysts which are known as persistent cervical sinus, or cysts of the cervical sinus. Rabl's and Winglowski's theories are compared. The authors agree with Rabl who, in 1887, described the formation of the branchial clefts and cervical sinus and demonstrated that the second cleft was much more apt to persist embryologically because of its greater depth and much longer normal persistence. Rabl came to the conclusion that the second cleft and its attachments are almost invariably at fault in the formation of branchial anomalies.

The authors disagree with Winglowski, who presented evidence that the branchial system could not

leave remnants in the neck below the hyoid bone, and concluded that all branchial fistulas and cysts were due to persistence of a portion of the thymic duct. They disagree with this theory because of clinical reports on the finding of branchial cysts below the hyoid bone, and because of the difficulty in differentiating cysts and fistulas of branchial origin from those of thymopharyngeal origin on an anatomical basis. They also allude to the fact that the microscopic picture of the walls of these cysts shows them to be lined usually by stratified epithelium and sometimes by columnar or ciliated epithelium, and rarely to contain thymic tissue.

RULON W. RAWSON, M.D.

Berlin, D. D., and Gargill, S. L.: Factors Influencing Persistent and Recurrent Hyperthyroidism. *New England J. Med.*, 1940, 222: 254.

The authors have studied a series of 15 cases of persistent or recurrent thyrotoxicosis which occurred among 235 patients who were operated on for toxic goiter between the years 1932 and 1938. Twelve of the patients were women; 3 were men. The group showing persistence or recurrence manifested more pronounced vasomotor imbalance and emotional instability, and a greater incidence of severe infections of the upper respiratory tract than did a control group. Inadequate thyroidectomy appears to be the chief factor responsible for persistent thyrotoxicosis, whereas this factor seems to be less important than psychic trauma, infections, pregnancy, the menopause, and the personality of the patient in cases presenting recurrent thyrotoxicosis.

Because of the difficulties of secondary thyroidectomy, the authors prefer to treat recurrent hyperthyroidism by the prolonged use of iodine alone, or iodine and one or two courses of x-ray therapy, except in the cases of patients showing a definite regeneration of thyroid remnants. If conservative methods fail to control the symptoms, operation is undertaken.

The authors believe that, except in juvenile hyperthyroidism, radical rather than conservative resection of the gland is indicated as the primary operation. They do not agree with some authors who believe that it is necessary to leave a liberal residue of thyroid tissue for the protection of the recurrent laryngeal nerves and the parathyroid glands. They do not routinely identify the recurrent nerves.

Persistent thyrotoxicosis occurred in 3 per cent of the series and recurrent thyrotoxicosis in 2.1 per cent. Permanent postoperative myxedema was noted in 3.9 per cent. JOHN A. GIUS, M.D.

Redisch, W., and Perloff, W. H.: The Medical Treatment of Hyperthyroidism. *Endocrinology*, 1940, 26: 221.

Opinion still differs as to the best mode of treatment of hyperthyroidism, but no one-sided viewpoint, such as surgery for every toxic case, or medical management for all, will do. Certainly both surgery and medical management have their respective places.

Only three conservative methods have withstood the test of time: the application of iodine, x-irradiation, and the use of Moebius' antithyroid principle.

Iodine if employed as Lugol's solution should be given in the form of sodium iodide instead of potassium iodide; this largely prevents the negative phase of the iodine medication. Among the patients who responded to iodine medication, 10 per cent were permanently cured, and 40 per cent were entirely symptom-free while taking iodine; 50 per cent were relieved but had some signs of thyroid disease.

X-rays seemed to be effective in about one-third of the cases; the combination of iodine and x-ray treatment might prove more effective.

The differentiation between toxic and exophthalmic goiter is not tenable. Iodine is contraindicated in old nodular goiters that have turned toxic, but it is harmless in true Graves' disease and puberal goiter.

The antithyroid principle is obtained from normal human serum and the serum of thyroidectomized sheep. It may have some favorable effect in mild cases. FRED S. MODERN, M.D.

Kurtzahn: Operation and Irradiation in Cases of Struma, Basedow Disease, and Thyrotoxicosis (Operation und Bestrahlung bei Strumen, Basedow und Thyreotoxikosen). *Deutsche med. Wchnschr.*, 1939, 2: 1387.

The author reports on 709 patients with disease of the thyroid gland who were observed over a period of ten years. Of these, 504 patients, with thyrotoxicosis, juvenile struma, cancer, and inoperable Basedow disease, were irradiated, and 205 were operated upon. Of the latter, 104 had colloid goiters (6 recurrent) and 101 had Basedow strumas. One patient with recurrence was operated upon the third time. Among those who were operated upon, only 9 were males and of these 4 had Basedow disease.

The incidence of thyrotoxicosis has increased since the World War. Kurtzahn ascribes an important rôle to psychic influences. A tendency toward the development of goiter may be inherited; the author repeatedly observed goiter in mother and daughter. The struma frequently appeared following childbirth. Irradiation is of no avail in the colloid type of goiter; it may be of value in the juvenile type, but this type may also disappear spontaneously. The hyperthyroid and the thyrotoxic strumas are not easily evaluated by any simple rules. For these it is better not to give iodine. The more complete the clinical picture, with a pulse over 100, an important loss in weight, and nervous symptoms, the clearer is the indication for operation; the exophthalmos plays merely a subsidiary rôle. In thyrotoxicosis, irradiation in conjunction with other methods of treatment may prove extremely effective. Preliminary treatment with diiodotyrosin and other iodine preparations, as

recommended by Siebeck, appears from Kurtzahn's experiences to demand a certain amount of caution. His attempts to obtain better results by increasing the irradiation dosage have been without effect; and the same results followed the simultaneous irradiation of the thymus. In his operations for Basedow disease he does a resection in special cases only. Cancer of the thyroid is extremely sensitive to irradiation. In a patient with recurrence accompanied by dyspnea there was a feeling of complete well-being three years later. In the patient with Basedow disease preliminary treatment is instituted but only for a brief period of from six days to three weeks. The author also gives iodine by thePlummer method; however, he expects the best results from psychic rest. He now always operates under general anesthesia, while previously he employed local anesthesia. He finds that in the first place, the general narcosis has a better psychic effect, and, in the second, postoperative bleeding is avoided. Testing of the voice during operation is of no value for if the patient's voice becomes hoarse it is already too late. The author employs eunarkon-ether anesthesia.

Kurtzahn formerly operated in two stages in severe Basedow disease. He no longer does this since he had 2 deaths during the second stage of the operation. He no longer carries the collar incision far out over the sternocleidomastoid region. The superior thyroid vessels are ligated doubly with silk, and a small remnant of the upper pole of the thyroid is permitted to remain *in situ*. The parathyroids were rarely recognized with certainty. The capsular vessels are ligated beforehand as otherwise they are difficult to get at in the depths of the wound. In the resection a considerable part of the external capsule is preserved in the thinnest possible stratum so that later it may be reunited over the trachea without tension. In order to forestall recurrence the pyramidal lobe is always resected. The short muscles of the neck must be carefully sutured, otherwise a deeply indrawn scar will result later. When the bed of the wound is free of blood, drainage is foregone. Four or 5 cutaneous sutures only are made in order to permit the secretions to pass out more easily; this procedure results in a better scar than tight suturing.

Complications in the form of postoperative bleeding were not experienced after local anesthesia was relinquished. Tracheotomy, because of softening of the windpipe, was done only once. Air embolism and tetany were not observed. In 2 cases there was an injury to the recurrent nerve; in one it was temporary, in the other permanent, but even in the latter case the voice returned almost completely. In the 205 operations Kurtzahn lost only 4 patients with Basedow disease; of these 2 died on the first day and 2 on the second. He is as yet unable to report on recurrences. Saegesser was of the opinion that one-fifth of the patients develop recurrences. The results of operation on Basedow disease are extremely satisfying; however, the patient must remain at rest for at least four weeks with moderate elevation of the upper part of his body and should resume his normal existence only gradually after three months have passed. The author saw improvement in the condition of the great majority of 500 patients who were irradiated for thyrotoxic strumas for longer or shorter periods of time, at times even permanent cure, particularly when the symptoms present were purely toxic and without an admixture of neurotic phenomena.

(Franz). John W. Brennan, M.D.

SURGERY OF THE NERVOUS SYSTEM

BRAIN AND ITS COVERINGS; CRANIAL NERVES

Snellman, A.: Experiences with Kirschner's Electrocoagulation in Trigeminal Neuralgia (Erfahrungen ueber die Kirschnersche Elektrokoagulation bei Trigeminusneuralgie). *Acta Soc. med. Fennicae Duodecim*, 1939, Ser. B., 27: Fasc. 1–2.

This is a report of 30 cases of trigeminal neuralgia which were treated by electrocoagulation. All of the patients were treated under sodium-evipal anesthesia as described by Kirschner.

All cases were carefully studied in an attempt to determine the causative factors. X-ray films were made of the skull in three projections, of the sinuses, and of the teeth. The nasopharynx and pharynx were examined by rhinoscopy, pharyngoscopy, and epipharyngeal palpation. The ears were examined directly with the otoscope and for any changes in hearing. The eyes were observed with attention directed to the retinæ, refractive changes, and signs of glaucoma. In addition to the usual blood studies, the sedimentation rate was determined. The cerebrospinal fluid was also studied.

Twelve patients had been previously treated with alcohol injections. One had been treated surgically by partial section of the nerve.

One coagulation was adequate to make the patient symptom-free in 25 cases. The remaining 5 patients had to have repeat coagulations from 1 to 3 times before they were free of pain. In the majority of cases there was a loss of touch, temperature, and pain sensation in the angle of the mouth and on the inner and outer surfaces of the cheek. Four patients developed an anesthesia of the end of the tongue. In 3 cases there followed a complete loss of trigeminal sensation. Five patients had a residual corneal anesthesia. A few patients developed masseter paralysis. In only 3 of these the paralysis was permanent. Four patients developed herpes labialis which disappeared within a few weeks. There were no wound infections. In no case was there a change in hearing nor a change in the cerebrospinal fluid. A few patients had postoperative fever of less than 1 degree. The period of hospitalization averaged seven days. Four of these days were postoperative. Three patients had recurrences. One of these was cured following a Caldwell-Luc operation. The other two were symptom-free following a repeat coagulation.

RULON W. RAWSON, M.D.

SPINAL CORD AND ITS COVERINGS

Munro, D., and Wegner, W.: The Bone Lesions Accompanying Cervical Spinal-Cord Injuries. *New England J. Med.*, 1940, 222: 167.

This short article should be read by every surgeon whose urge it is to operate upon early, or manipulate early, serious fractures of the cervical spine, and by those who cannot differentiate in their own minds the considerations necessary for cervical-spine injuries and those of other parts of the vertebral column.

The authors have pointed out that the treatment and prognosis of cervical-spine injuries will vary according to whether the cord was injured or not, and they believe it is imperative to differentiate the true acute cord injury at the time of the accident, from the chronic lesion in which cord damage comes about later. Their experience is based on a series of 76 cases. Cervical-spine lesions usually occur between vertebræ C_1 and C_2 and C_4, C_5, and C_6, and they are usually the result of indirect violence which causes excessive flexion. Simple illustrations make these points clear. X-rays are the most important of all diagnostic agents. Treatment of the bone lesion is varied to suit the therapeutic needs of the damaged cord and the presence or absence of a spinal subarachnoid block. Traction in moderate hyperextension is used, employing the chin halter or direct bone traction, and this is maintained for from six to nine weeks, following which a leather support is fitted. Even in the presence of a subarachnoid block the cord is not decompressed immediately, but only after a trial at relief of the block by traction and hyperextension. Manipulation of the vertebræ is not considered to be generally useful, wise, or safe. Tidal drainage for bladder care was of much advantage to these authors. They state that their mortality has dropped more than 30 per cent since the abandonment of immediate laminectomy as a therapeutic measure, and without doubt this reflects the experience of other neurological surgeons who have observed their comparative results of early and delayed cord decompression. JOHN MARTIN, M.D.

PERIPHERAL NERVES

Stahl: Surgery of the Peripheral Nerves (Zur Chirurgie peripherer Nerven). *Zentralbl. f. Chir.*, 1939, p. 2248.

The results of operations on the peripheral nerves are not as favorable as many authors have intimated. On the basis of two extensive statistical studies, that of Otfried Foerster with 370 personally performed operations, and that of Wexberg, comprising between 12,000 and 13,000 cases from 15 different surgeons, it may be stated that good results have been reported in 50 per cent and in only 40 per cent of the cases in which resection was followed by suture. Stahl has previously pointed out the severity and peculiarities of the plexus injuries. Recently this form of injury shows a definite increase, because of motorcycle accidents. However, it is erroneous to ascribe these injuries solely to stretching effects; in the author's 20 cases there were only 2 such lacera-

tion effects. In these instances the hand became caught in the driving gear and the thus abducted arm was distended by the abduction and torsion of the head in the other direction. In the majority of cases, however, the cause of the injury is the direct crushing of the nerve by the processus transversus of the vertebra. This could be demonstrated by the author at operation by the localized scarring or the localized lacerations. Kuettner has taken an entirely nihilistic stand in the matter of plexus injuries because of the fact that in 6 cases he did not obtain a single successful result. Stahl is unable to share such a viewpoint; however he states that one should not wait too long, but must operate much earlier than in involvements of the other peripheral nerves. It is true that to an extent the initial, usually total, paralysis disappears in most instances; however, this action quickly comes to a still-stand, and at this time operation should be instituted without waiting for degeneration. Patients pronounced neurologically incurable should not be excluded from operation, though it is certain that the results of suture of the nerve are more unfavorable the longer one waits. It is well known that the further central the lesion is located, the later regeneration occurs. In general, the periods of follow-up are too brief; frequently restitution occurs years later. Emphatically, electric treatments should be carried on for a long time, not merely for a half or one year. Nor does Stahl support the viewpoint that the successive stages of restitution are first, return of sensibility, then motility, and, last, the electric reaction. In this regard he reports 2 instances wherein the electric reaction presaged the process of restitution; in 1, a suture of the radialis, degeneration was present for five years, and only after that did the reaction return to normal, and it was followed by disappearance of the paralysis three-quarters of a year later.

Stahl presents in detail the case histories of his first 8 operations on the plexus, which were done more than four years previously. In 2 instances the improvement has been extremely gratifying; in 1 the extensors of the forearm again function completely and the flexors almost completely; in the other the upper arm, completely, and the flexors of the forearm function. In the remaining 6 cases there was partial improvement; total failure occurred in only 1 patient. Most striking was the fact that vasomotor disturbances or pain, which is usually a frequent accompaniment, was not present in any case.

In the more recent experiences of the author, comprising 12 operations, he has been more fortunate; now after two and one-half years an essential improvement of motility is present in 3 patients. One of the injured has been able to resume his former occupation of skilled mechanic. The improvement in Stahl's results has been secured by resection and suture and not by neurolysis. Therefore, suture is to be preferred when the nerve, after it is loosed from the investing cicatricial tissue, does not give the impression of being entirely uninjured and portrays its normal electric irritability.

In the discussion ZELLER cites several cases of gunshot injury to the plexus during the war which were operated upon with success. He supports the view that even in cases designated as inoperable by neurologists operation should be attempted. He covers his nerve-sutures with vena-saphena wall; at first he employed calf-artery for this purpose, but this material produced cicatricial adhesions. Two cases are reported in detail: In the one, in which the radialis and axillaris strands were so heavily embedded in cicatricial tissue that following resection they could not have been reunited, an external neurolysis was all that was attempted and complete restitution after seven and one-half months resulted. The other case was that of a peripheral injury to the ulnaris. A resection with suture had been without result. Since a total main en griffe had developed a year later the nerve was again exposed and a dense cicatricial mass was found, in which were embedded 2 terminal neuromas—at the first operation the suture line had been covered by calf-artery. Nine and one-half centimeters were resected, after which suture was impossible. Consequently the two stumps were implanted into lateral incisions of the medianus nerve. One year later the lumbricals, interossei, and flexor carpi ulnaris were completely innervated, the fifth finger and thumb could be adducted, and the contractured positions of the fourth and fifth fingers were removed; all this resulted without any form of after-treatment. A normal anastomosis with the medianus nerve was excluded by the whole course of the process. Furthermore, in 1 case improvement was noted after suture of the cauda equina, so that operative procedures may be recommended in this instance also. (FRANZ). JOHN W. BRENNAN, M.D.

Smithwick, R. H.: A Technique for Splanchnic Resection for Hypertension. *Surgery*, 1940, 7: 1.

From his experience with approximately 150 sympathectomies for hypertension the author believes that sympathectomy yields its best results when the operation is (1) adequately complete, (2) preganglionic in type, and (3) extensive enough to guard against future regeneration of the interrupted pathways.

It is known that the splanchnic bed is man's mechanism for maintaining his blood-pressure level relatively constant in the lying, sitting, and standing positions. If the splanchnic bed is well denervated, the blood-pressure level should fall as the patient changes from the lying to the sitting and standing positions. This actually occurs, and Smithwick believes that the change which is produced in the blood-pressure levels is the only reliable manifestation from which the completeness of the operation can be judged.

The author's impression of the anatomical pathways to the splanchnic bed is shown in Figure 1. He found that adequate exposure of this entire region could be obtained by resection of the twelfth rib, through a hockey-stick incision. The upper portion is vertical, about 2 in. lateral to the midline, and

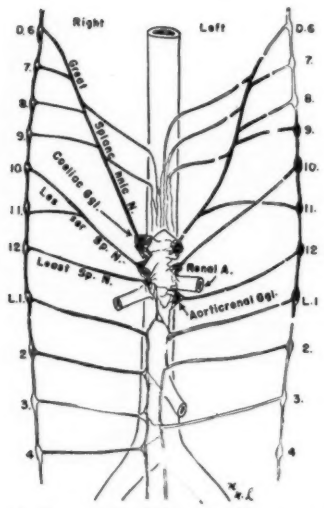

Fig. 1. A diagrammatic sketch of the nerve supply to the splanchnic bed. On the left side the area to be removed on both sides is blacked out. This is the minimal procedure which we have found to be followed consistently by an immediate postural change in blood pressure.

runs up over the inner end of the eleventh rib. The lower portion curves laterally, ½ in. below and parallel to the twelfth rib. The sheath of the sacrospinalis muscle is opened vertically to below the twelfth rib, and dissection is then carried laterally following the skin incision through the deeper structures below and beyond the tip of the rib. The twelfth rib is removed from the transverse process to the lateral border of the sacrospinalis sheath. The twelfth intercostal artery, vein, and nerve are resected over a similar area. The diaphragm is divided from its lateral border to the spine, 1 in. below and parallel to the pleural reflection. The pleura is then separated from the thoracic cage up to the middorsal region.

The kidney is then exposed and inspected. The adrenal gland is readily seen and explored. The sympathetic trunk and paravertebral region are exposed from D9 to below D12. The great splanchnic nerve can be seen from its insertion in the celiac plexus upward for virtually its entire extent, with its important branches running to the aorta above the diaphragm. The exploration having been completed, the desired portion of the splanchnic supply is then removed. The minimal procedure which Smithwick has found consistently to produce a blood-pressure change is: removal of virtually the entire great splanchnic nerve with division of all its aortic branches, coupled with interruption of the communicating rami of D9, D10, D11, D12, and L1, together with excision of the sympathetic trunk over this area. The diaphragm is now resutured and the wound closed in layers with silk technique. Intratracheal anesthesia is used. The operation is done in two stages from one to two weeks apart. Since September, 1938, the author has performed 26 such operations without operative mortality or serious complications. DAVID J. IMPASTATO, M.D.

SURGERY OF THE THORAX

CHEST WALL AND BREAST

Dodd, H.: Simple Tumors of the Breast and Their Treatment. *Australian & New Zealand J. Surg.*, 1940, 9: 228.

This author describes a method of dealing with tumors of the breast in their early stages, whether or not they are malignant. It is apparent that if a carcinoma is ever curable it is in its very earliest stage. He believes that of all true tumors of the breast 95 per cent are either fibro-adenomas or carcinomas and that about 80 per cent are carcinoma. For this reason he regards every tumor of the breast as malignant until it is proved to be otherwise.

The author further states that breast tumors should never be enucleated, but should be removed *en bloc* with the surrounding lobe.

Simple tumors of the breast may develop from all of the various tissues in the breast. Therefore they may be cysts, papillomas or fibro-adenomas. There are 2 types of fibro-adenoma—the intracanalicular and the periarticular. The intracanalicular type is more fibrous than glandular and looks somewhat like a cut cauliflower on macroscopic section. Small pedunculated papillomas can be picked up from the cavities, and occasionally cystic degeneration takes place. The tumor is usually translucent. These tumors are found in women of from thirty-five to fifty-five years of age. The periarticular type is characterized by its extreme mobility. It bobs about in the breast like a "cork on water," is hard to touch, but can be cut easily. Patients with these tumors are usually nervous, emotional, and debilitated, and they may complain of neuralgic pains in the breast. The tumors are usually about the size of a walnut and can be shelled out of the breast tissue, although the author never practices this method.

Duct papillomas are small papillomatous outgrowths into the lactiferous ducts near the nipple. A cyst develops about this small tumor and this cyst forms a mass which can be felt. Very soon blood stain or a bloody discharge at the nipple appears. the author regards these tumors with suspicion and always advises early mastectomy. This may appear drastic but it is safe. The temptation to carry out conservative operation with retention of the nipple is an attractive one which should be firmly resisted.

Cysts are often part of a chronic or lobar mastitis. Occasionally a discharge appears from the nipple. When the swelling is large they may distort the contour of the breast. The cyst is circular or elliptical and generally movable in the breast tissue from side to side, but not always radially from the nipple. The axilla may contain small insensitive glands and the opposite breast may also be nodular. Multiple cysts usually are of benign character and require a mastectomy. A galactocele is a retention cyst of milk, due to obstruction of a main duct after lactation.

Other simple tumors are chronic pyogenic abscess, tuberculous abscess, gumma, fat necrosis, lipoma, pure adenoma, hematoma, single serous cyst, and hydatid cyst. The lobectomy, rather than enucleation, in such tumors will avoid trouble and danger.

The operation described consists of a mammary lobectomy. It has 2 objects in view: first, the avoidance of incision of the tumor or the neighboring lymphatics; second, it aims not to deform the breast. The author uses a general anesthetic. The operation is then begun by seizing the nipple with a pair of towel forceps and drawing it diametrically away from the tumor. An incision beginning at, and radiating from, the nipple and passing precisely over the center of the tumor to the circumference of the breast is made. If the tumor is large it is advisable to excise an elliptical area of skin. This ellipse of skin is outlined accurately by scratching it with the point of the scalpel before making the incision. The skin edges are elevated and the skin flaps are flayed back, devoid of fat or vessels, for a short distance. The reflection extends from the nipple to the mammary circumference. At the circumference the fatty tissue is incised deeply down to the fibers of the pectoralis major muscle. This opening is then stretched by scissors and first one finger and then two fingers are inserted beneath the gland to the plane of cleavage between the breast and the muscle below. In this way the lobe is mobilized and elevated from the periphery to beneath the nipple. The next step is a little difficult. It consists of the insertion of a pair of pointed curved artery forceps vertically down at the nipple and into the breast, into the plane of cleavage in which the surgeon's fingers rest. This marks with precision the apex of the lobe to be removed. The limits of the lobe are now defined and the surgeon's fingers rest beneath it on top of the pectoralis major muscle with the finger tips at the point of the lobe at the nipple. It is now easy to excise the triangular area upon the surgeon's fingers, which is limited centrally by the forceps. After excision the cavity which has resulted is closed by approximating accurately the edges of the cut breast tissue with a continuous suture. The skin is then closed and a drainage tube is rarely necessary. A voluminous dressing is applied.

The tumor is immediately sectioned and if it is found to be carcinomatous, a swab wrung out in pure carbolic acid or perchloride of mercury is inserted into the cavity, to fix any neoplastic cells incised and free in the area. The radical operation is then performed. J. DANIEL WILLEMS, M.D.

Adler, H.: The Function of the Thymus and the Adrenal Glands (Thymusfunktion und Nebennieren). *Deutsche Ztschr. f. Chir.*, 1939, 252: 241.

It is known that excessive activity and an increased internal secretion of the thymus gland leads

to abnormal muscular fatigue. This condition can be checked immediately by giving prostigmine, which probably stops the rapid destruction of acetylcholine and transfers the nervous stimulus to the muscle. This excessive destruction of acetylcholine is caused by an oversecretion of thymus juice. Besides the eye-muscle disturbance in Graves' disease, the general myasthenia which is often observed can be eliminated by the administration of prostigmine. Thus it is possible to relate this disease to thymus hypertrophy. In Addison's disease the high degree of myasthenia and overfunction of the thymus is known.

Since this disease is rare, an attempt was made to solve the problem by experimental methods. If removal of the adrenal glands brought about increased activity of the thymus, would this result in excessive muscular fatigue? With the lower leg of a narcotized animal fixed and prepared in such a way that stimulating the gastrocnemius muscle moved the ankle joint, the muscle was stimulated with the faradic current, for one and one-half hours; and after a small initial decrease an entirely level curve was obtained. After removal of both adrenal glands the muscle could not be stimulated by the faradic current after two and one-half minutes. After a rest of two minutes the excitability of the muscle returned but disappeared more quickly. Finally the two minutes of rest made no difference and the muscle remained practically unexcitable. By giving the animal prostigmine after the onset of the unexcitability of the muscle, the excitability returned quickly and could be maintained for a whole hour on an equal level, which differed only slightly from the initial height of the curve. In a further experiment, with extirpation of the thymus and removal of the adrenal glands, the muscular fatigue did not show up at all.

(Max Budde). Frederic W. Ilfeld, M.D.

TRACHEA, LUNGS, AND PLEURA

Rosenblatt, M. B.: Putrid Lung Abscess. *J. Thoracic Surg.*, 1940, 9: 294.

Ninety-four cases of putrid lung abscess treated between 1920 and 1938 form the basis for this study.

Fifteen were postoperative and 10 of these followed operations on teeth, tonsils, jaws, or the nose. There were 79 non-postoperative cases. Ninety-four per cent of these were not preceded by any known disease, accident, or operation. The aspiration of septic tartar into the lungs as a cause for the development of putrid lung abscess deserves serious consideration.

The distribution by lobes was as follows: right upper 29 cases, right middle 2 cases, right lower 30 cases, left upper 13 cases, and left lower 22 cases.

The most important complications were putrid empyema in 12 per cent and cerebral metastasis in 3 cases.

Seventy-two cases were treated medically, that is, by postural drainage, bronchoscopic aspiration, artificial pneumothorax, and various drugs. On discharge 5 per cent were cured, 4 per cent improved, 44 per cent unimproved, and 47 per cent had terminated fatally.

Twenty-two of the 94 cases were treated surgically after an average stay in the hospital of forty-five days. Of these, 29 per cent were cured or improved, 14 per cent unimproved, and 57 per cent had terminated fatally.

The author concludes that the conservative treatment of pulmonary abscess is valueless. He believes that the patient should be observed for a period of approximately six weeks from the onset of the illness. If then there is no roentgenological evidence of resolution, operation should be done.

Julian A. Moore, M.D.

Overholt, R. H., and Rumel, W. R.: Primary Carcinoma of the Lung. *J. Am. M. Ass.*, 1940, 114: 735.

The lung is a common site of primary carcinoma. Autopsy studies reveal that 10 per cent of all primary cancers originate in the lungs. It is estimated that 15,000 people in the United States die each year from carcinoma of the lungs.

Radiation therapy in all forms has failed, not only as a cure but as a means of palliation. There is no recorded authentic case of a five-year cure by irradiation. Recent studies revealed that, on the average, patients who received high-voltage roentgen therapy lived only two-thirds as long as untreated patients.

The authors state that the general consensus now is that all primary carcinomas of the lung arise from a single undifferentiated parent cell located in the basal layer of the bronchial epithelium. The degree of differentiation determines the type of tumor.

The symptoms and signs may be divided into several stages:

1. The stage before bronchial occlusion. There is first a dry irritative cough, soon a clear thin mucoid sputum, and later blood streaked sputum or hemoptysis.

2. The stage of bronchial occlusion. (a) Partial occlusion with emphysema; physical examination reveals, over the involved area, hyperresonance, emphysematous sounds and moist expiratory rales, and rhonchi. Roentgenograms may show a wedge-shaped area of decreased density with convex borders. (b) Complete occlusion with atelectasis; dyspnea, a discomfort or feeling of weight and constriction in the chest are noted by the patient. The physical signs are dullness, diminished breath sounds, and fremitus. Roentgenograms show a dense, wedge-shaped shadow with concave borders extending from the hilum out to the chest wall. (c) Bronchial occlusion with secondary infection; the symptoms and signs and the roentgenological picture vary greatly because of the presence of infection, which may produce pneumonitis, abscess, or even gangrene of the lung.

3. The stage of extension or metastasis—This represents the last stage, when nothing can be done for the patient, and it is therefore of little importance.

The authors present 75 cases of proved carcinoma of the lung on which this study is based. The lesion was located in the stem bronchi in 57 cases and in the periphery in 18 cases. The most frequent symptoms were cough, fever, pain, or discomfort, hemoptysis, weight loss, and dyspnea. Physical signs were present in 93 per cent of the cases; definite roentgenological changes were noted in 96 per cent; and a shadow of the tumor itself was present in only 17 per cent.

Of all diagnostic procedures, bronchoscopy is the most valuable. Approximately three-fourths of the authors' cases were visualized by bronchoscopy. A positive biopsy was obtained in 53 cases. Not only is this procedure valuable as a diagnostic agent, but it is useful in relieving infection subsequent to obstruction.

The authors condemn aspiration biopsy as a dangerous procedure and prefer an exploratory thoracotomy when other diagnostic means have failed. This procedure was carried out in 38 cases.

Pneumonectomy was done in 21 of the 75 cases and lobectomy in 4. Of the 4 patients treated by lobectomy, 1 is living and well sixteen months after operation. Of the 21 patients in whom pneumonectomy was done, 8 are living and well, with no evidence of recurrence. The longest survivals are 1 of six years and three months, 1 of five years and ten months, and 1 of three years and ten months.

Surgery offers the only hope of cure in cancer of the lung, and it can be done with a reasonable mortality rate. Early diagnosis is essential to successful surgical eradication of the disease.

JULIAN A. MOORE, M.D.

Armand-Ugón, C. V.: Anterior Mediastinal Empyema (Empiema mediastinal anterior). *Arch. uruguayos de med., cirug. y especial.*, 1939, 15: 341.

Armand-Ugón states that anterior mediastinal empyema may extend forward and outside to reach the thoracic wall and simulate an anterior parietal empyema. It often remains undiagnosed because (1) it has no definite clinical symptomatology, (2) a good roentgen examination is made difficult by the serious condition of the patient, and (3) correct interpretation of the roentgenogram is prevented by the superimposition of the cardiac shadow.

The author describes the case of a patient who had postinfluenzal bronchopneumonia. A roentgenogram was taken after twenty-three days because there had been no frank remission, although the symptoms of intoxication had decreased. The film showed apparent increase of the cardiac shadow, elevation of the right diaphragm, and a pleural shadow projected in the middle zone of the lower lobe above the diaphragm. Four days later, the patient vomited a large quantity of pus containing pneumococci and had copious expectoration during the following days. As there were two suppurating foci, one of which had been partially emptied, it was thought advisable to operate first on the intact focus, leaving the mediastinal empyema for a second intervention. The general condition of the patient improved after the evacuation of the pleural focus. Ten days later, the mediastinal empyema was opened and drained and the patient soon recovered.

The diagnosis of anterior mediastinal empyema must be made from a juxtacardiac opaque or hydroaerial roentgen image. Before vomiting has occurred, the roentgenogram shows a convex or triangular shadow with diaphragmatic base, doubling the right auricle or, more rarely, the left ventricle. A lateral roentgenogram is necessary to localize the empyema in the middle or anterior portion of the mediastinum.

The differential diagnosis must be made from acute dilatation of the heart and from pericarditis. There are two important roentgen signs of empyema: the displacement of the mediastinum toward the healthy side, and the paresis of the corresponding half of the diaphragm. These signs were present in the reported case and allowed localization of the suppurative process in the mediastinal pleura. The paresis of the hemi-diaphragm is due to irritation of the phrenic nerve in its course through the mediastinum. The differential diagnosis between mediastinal empyema and suppurating mediastinitis is difficult or impossible, because both disorders coexist: in favor of mediastinitis are an esophageal lesion and low cervical suppuration, anginal symptoms, pain in the shoulder, and symptoms of compression of the large vessels. Opacifying lesions of the middle lobe do not show the distinct delimitation of mesial empyema, nor the displacement of the mediastinum toward the healthy side; in fact, the displacement is toward the side of the lesion. Bronchography may be useful.

After vomiting has occurred, the roentgen image of anterior mediastinal empyema is characterized by a juxtacardiac cavity with a fluid level. It must be differentiated from acute pulmonary abscess in which the process does not remain circumscribed to the mediastinal pulmonary superficies, but invades the parenchyma of the lung at a distance from the mediastinum. In empyema, the great axis of the cavity is vertical, while in abscess it is usually horizontal. In addition, the fluid level of empyema in frontal exposure, being retrosternal, is projected fully in the mediastinum, and this location excludes a pulmonary process. Finally, in case of doubt, exploratory puncture may be used in spite of mediastinal and cardiac danger. If it is positive, a few cubic centimeters of lipiodol and air are injected before withdrawal of the needle in order to permit good roentgen localization of the empyema.

RICHARD KEMEL, M.D.

HEART AND PERICARDIUM

Bigger, I. A.: The Diagnosis and Treatment of Heart Wounds, with a Summary of 25 Cases. *South. M. J.*, 1940, 33: 6.

The majority of patients with penetrating wounds of the heart who survive sufficiently long to receive surgical aid have stab wounds. These wounds do not

often completely perforate the heart and the small slit in the anterior pericardium is displaced away from the wound in the chest wall as the pericardial sac fills, and the blood is trapped with resulting tamponade. As the intrapericardial pressure rises, the venous pressure rises and the systolic blood pressure falls. This results in circulatory collapse, and if the victim continues to struggle death may ensue rapidly. If he survives the early period of circulatory collapse and is given proper treatment, there is usually a temporary circulatory adjustment with distinct improvement in his general condition. In most instances it is during this period of improvement that operation should be performed.

The history is usually of little help in the diagnosis of heart wounds; in fact, a satisfactory history usually is not obtainable. However, a patient with a wound in the cardiac area, and any bullet wound of the thorax may involve this area, who shows circulatory collapse out of proportion to the blood loss, should be suspected of having cardiac tamponade. The most important signs of tamponade are: a weak or absent radial pulse (if the pulse is palpable it is less rapid than one would expect); distention of the superficial cervical veins; and distant muffled heart sounds. To be certain of the character of the heart sounds auscultation should be carried out on both sides of the sternum. If tamponade is suspected but there is reasonable doubt as to the diagnosis, fluoroscopic examination should be done as the final diagnostic measure. In the presence of tamponade the cardiac pulsations are obliterated and the pericardial shadow appears practically immobile. This is important in the diagnosis and gives some indication as to the type of treatment indicated. Since 1935 the diagnosis of cardiac tamponade has been confirmed in 13 patients by fluoroscopy and in no instance have the fluoroscopic findings been misleading. Roentgenograms are of no value in diagnosis.

Patients with only moderate intrapleural hemorrhage without the signs of tamponade are treated conservatively even though pericardial injury is proved by the presence of both blood and air in the pericardial sac. Patients with tamponade who respond to conservative treatment by a return of the blood pressure to a normal level should be treated conservatively, for such a rise of pressure probably means that the bleeding has been spontaneously controlled. However, they should be watched carefully for several hours and have frequent blood-pressure determinations and venous-pressure readings. If the pressure gradually falls after the preliminary rise, the pericardium should be aspirated and if, following this, there is no further evidence of intrapericardial hemorrhage, operation is not indicated. If tamponade continues to recur, operation is indicated. In elderly patients, especially those with a history suggesting coronary disease, operation should be avoided if possible.

Patients with tamponade and persistently low systolic blood pressure should be operated upon as soon as possible, but sufficient time must be allowed for the use of proper aseptic precautions. In the more serious cases aspiration is done while the operating room is being prepared. This is important not only because it may prevent death from circulatory failure but also because prolonged cerebral anoxemia may cause paralysis, mental deterioration, or even death.

Heparin is administered postoperatively to patients with wounds which penetrate any of the chambers of the heart or divide important coronary vessels. CHARLES BARON, M.D.

Sciacca, F.: The Surgical Treatment of Revascularization of the Myocardium in Conditions of Insufficient Cardiac Irrigation, with Special Consideration of Angina Pectoris (Il trattamento chirurgico di rivascolarizzazione del miocardio negli stati d'insufficiente irrorazione cardiaca, con speciale riguardo all'angina di petto). *Clin. chir.*, 1939, 15: 815, 887, 995.

Sciacca discusses the anatomy of cardiac and extracardiac vascularization and reviews the literature on the pathological anatomy of the vascular insufficiencies of the myocardium, on the experimental data obtained by ligation of the coronary vessels, and on the method of revascularization, including the experimental results and the operations performed in man by Beck and by O'Shaughnessy. The author's experiments were made exclusively to verify histologically the processes of revascularization of the myocardium. He used 28 rabbits, which he divided into four groups: (1) those in which he performed a cardiomusculopexy, according to the method of Beck; (2) those in which he performed this operation associated with ligation of the anterior descending coronary branch; (3) those in which he performed a cardiopneumopexy, according to the method of Lezius; and (4) those in which he performed the latter operation associated with ligation of the anterior descending coronary branch. Ten animals died from the operation and the remaining 18 were killed at intervals varying from thirty to one hundred days after the intervention.

The muscular and pulmonary grafts took well without any refinements of technique and without distinction between cases in which the coronary artery had been ligated and those in which it had not. There was always a marked abundance of newly formed vessels in the zone of adhesions, but their functional value could not be confirmed; however, their value has been demonstrated by other authors by the survival of the animal after ligation of the two coronary arteries in a second-stage operation. Clear and convincing passage of the newly formed vessels from the tissue of the graft directly to the myocardial tissue could not be observed in any case. No difference in the number of newly formed vessels could be clearly established between animals in which the coronary artery had been ligated and those in which ligation had not been performed. However, contrary to the teachings of general

pathology concerning the temporary character of newly formed vessels in cicatricial tissue, these vessels were found to persist even in the animals killed as long as one hundred days after the operation. The number of newly formed vessels did not seem to differ with the muscular or pulmonary nature of the graft.

The large number of experiments already made and the successful applications of the method in man do not leave any doubt that this kind of revascularization is possible and useful. This imposes a revision of many principles which were considered as established in cardiac pathology. For instance, it has been accepted as a fact that any change in the pericardium has an injurious effect on the action of the heart, and surgical efforts have been made to remove these anatomicopathological conditions. The studies on revascularization have shown that this concept was greatly exaggerated, as revascularization artificially creates this feared condition without revealing any bad influence on the normal activity of the heart. Whether the natural exhaustion of the heart will be accelerated by the intervention cannot be stated at present, but it is reasonable to think that the eventual disadvantages for the myocardium will be amply compensated for by the advantages provided through a new blood supply to a heart that is insufficiently nourished. Some of the cases of angina pectoris treated by Beck have now nearly reached the maximal survival limit of five years generally admitted for this disease.

The principal indication for revascularization is the treatment of angina pectoris. The demonstration of the presence of coronary sclerosis, not much complicated by spasm, justifies the use of the method of revascularization, which is certainly preferable to thyroidectomy or other interventions. On the other hand, evidence of vascular spasm indicates the advisability of medical treatment, sympathetic intervention, or injections of novocaine or alcohol into the nerve: this applies to all so-called cases of reflex angina, angina without coronary sclerosis, and extracardiac angina. The real value of revascularization will be known only when the pathogenesis of angina pectoris is completely understood. In the meantime, the intervention must be reserved for cases in which there is an evident nutritional deficiency of the myocardium. It is also indicated in many other conditions in which there is a nutritional defect without angina, such as coronary occlusion without pain, a cardiac infarct of any nature (for both cure and prophylaxis), and insufficient cardiac irrigation due to valvular defects and to many lesions which lead to debility of the myocardium. RICHARD KEMEL, M.D.

Westermann, H. H.: The Indication for Operation in Pericarditis (Die Indikation sur Operation der Herzbeutelentzuendung). *Klin. Wchnschr.*, 1939, 2: 1237.

The indications for operation in pericarditis are discussed on the basis of the wide experience at the Clinic of Frankfort, Germany. The total mortality from the operation amounts to 44.1 per cent while the recoveries and improvements amount to 55.9 per cent. Not every case of pericarditis requires surgical treatment. Many represent secondary symptoms which cause no discomfort and therefore may remain untreated. An indication for operation is given only in manifestations of cardiac dysfunction with obstruction to the return flow of blood to the heart.

Since acute cardiac insufficiency is usually present when the patients are admitted to the Clinic, they must receive preliminary medical treatment. The basic ailment in pericarditis never constitutes a contraindication, but the problem rests with the momentary stage of the illness. Experience at the Clinic has taught that the majority of cases of pericarditis are caused by progressive pulmonary or pleural tuberculosis. For this reason operation should not take place during the serous-inflammatory stage of the illness because of the danger of fistular formation.

Restraint is advised regarding operation. In the atrophied type of pericarditis with distinct clinical obstruction of the return flow of blood to the heart, indication for operation should be considered as promptly as possible as otherwise the heart muscle may suffer serious and irreversible damage. The cardiac muscle becomes atrophied and is in danger of passive overdilatation after the operation, which results in sudden death from acute tricuspidal insufficiency. Permanent recovery after pericardectomy is attributed solely to the early indication for surgical removal of the callous sheath enveloping the heart.

Precardial cardiolysis according to Brauer does not come into consideration because it is not sufficiently radical. Partial resection of the pericardium as recommended by Délorme, Rehn, and Schmieden is the only technique used.

(WESTERMANN). HILDA H. WULLEN.

ESOPHAGUS AND MEDIASTINUM

Schmidt, H. W.: Diffuse Spasm of the Lower Half of the Esophagus. *Am. J. Digest. Dis.*, 1939, 6: 693.

This paper calls attention to a group of cases of occlusion in the distal portion of the esophagus, due to diffuse spasm. Spasm of the distal portion of the esophagus can be produced experimentally by the stimulation of various nerves. Spasm has been observed clinically secondary to organic lesions of the esophagus, stomach, gall bladder, and biliary tract, and in cases of organic heart disease. Spasm of the distal part of the esophagus occurs among certain nervous individuals when they are placed under emotional strain.

Diffuse spasm of the distal half of the esophagus is a condition which is usually characterized by dysphagia and pain. The condition may go on to complete esophageal obstruction. The pain may resemble that caused by disease of the stomach or of the gall

bladder, or by organic heart disease, and for these reasons an incorrect diagnosis may be made; thus treatment may be directed toward a condition which does not exist. Pain at times is very severe and is usually situated in the lower retrosternal region, but it may extend to the epigastrium, to the back, into the neck or ears, or to the angle of the jaw.

The roentgenoscopic examination is very important. The 3 main pictures are those of (1) diffuse irregular spasm, (2) multiple spastic segments, and (3) diffuse narrowing of the distal half of the esophagus. The condition is definitely different from that of cardiospasm. Esophagoscopic examination shows evidence of spasm in the distal half of the esophagus.

Satisfactory treatment has not as yet been evolved. It is important that fatigue, nervous strain, anxiety, and emotional upsets be avoided, for they almost invariably precipitate an exacerbation of the symptoms. Most of the individuals who suffer from this condition are tense and nervous. Esophagoscopy and dilation of the esophagus by means of sounds and the hydrostatic dilator may give partial relief, but the results of dilating the spastic esophagus are in no respect so striking or so satisfactory as they are in cases of cardiospasm.

A method for studying esophageal contractions and the effect of various drugs on the distal portion of the esophagus has been described. Objectively, a decrease of tone and of contractions was observed after inhalation of amyl nitrite. The effect was great but transitory. This effect has been observed through the esophagoscope in cases of diffuse spasm of the distal portion of the esophagus. Morphine sulfate given intravenously caused rather severe, prolonged relaxation of the distal portion of the esophagus. Atropine sulfate gave conflicting results.

Seventeen cases of diffuse spasm of the lower portion of the esophagus encountered at the Mayo Clinic between January, 1935, and September, 1938, were studied. In 15 of the 17 cases this condition was the primary chief complaint. Seven of the patients were women and 8 were men. The youngest patient was thirty-one years of age and the oldest, seventy. Other conditions were found in certain cases of the group, which might have been partly responsible for the esophageal spasm. These conditions were diverticula of the distal portion of the esophagus, duodenal ulcer, duodenal diverticulum, chronic cholecystitis with cholelithiasis, and a pelvic tumor. One patient had asthma, one had diabetes mellitus, and one complained of sore gums secondary to dental extraction. Objectively, morphine sulfate and amyl nitrite caused relaxation of the distal part of the esophagus; subjectively, certain patients were helped by stramonium, others by papaverine.

Biezinš, A.: Total Esophagoplasty in Children (Ueber die Methodik der Totalen Oesophagoplastik bei Kindern). *Acta Soc. med. Fennicae Duodecim*, 1939, Ser. B., 27: Fasc. 1–2.

This author reports 11 cases of atresia of the esophagus in children between the ages of ten and twelve years who had an artificial esophagus constructed. There were no deaths in this series.

The operation was performed in six stages with an interim of from six to twelve weeks between stages. The first stage was that of constructing a skin canal from the left side of the neck to the epigastrium with a piece of skin which measured from 5 to 5.5 cm. in width. In the second stage a part of the jejunum was mobilized and transplanted under the breast skin. Precautions were taken to preserve the blood supply of the transplanted bowel and to prevent any pressure on the bowel through the skin opening. In the following step the esophagus was freed in its upper half. The transplanted bowel was united with the skin canal in the fourth step. In the fifth stage the lower end of the transplanted bowel was anastomosed with the cardia of the stomach. In the final step the esophagus was united with the upper end of the artificial canal by an end-to-end anastomosis. The canal was carefully covered with skin. RULON W. RAWSON, M.D.

MISCELLANEOUS

Crafoord, C.: Pulmonary Ventilation and Anesthesia in Major Chest Surgery. *J. Thoracic Surg.*, 1940, 9: 237.

During inhalation anesthesia, the alterations in the physiology of respiration which takes place with a wide open chest on one side are, briefly, as follows: during inspiration gas flows down through the trachea and into the lung on the unopened side because of expansion of the thorax and the increased negative pressure within this lung. At the same time, as soon as the intrapulmonary pressure on the unopened side becomes more negative, there is a flow of gas from the lung on the opened side into the lung on the unopened side. There is also a movement of the mediastinum to the unopened side which decreases the volume of gas flowing into that lung. During expiration there is a less negative or positive pressure in the lung on the sound side which is mainly due to the contraction of the expiratory muscles. This blows the gas out of the lung, and a part of it flows back into the lung on the opened side and a part out through the trachea. This results in a low tidal volume and an impaired gas exchange. Positive-pressure anesthesia will stabilize the mediastinum, but does not stop the pendulum flow of gas between the lungs, which is greater than realized.

Positive-pressure anesthesia increases the difficulty of expiration and requires the patient to use greater muscular effort. This results in an increase in the carbon-dioxide content of the blood and acidosis because of gradually increasing expiratory deficiency. Even with positive-pressure anesthesia, one cannot overcome all of the difficulties of respiration. Low positive pressures result in paradoxical motion of the mediastinum and higher positive pressures increase the expiratory difficulties.

Experimentally, the author has shown that with positive-pressure anesthesia, acidosis, due to the

increased carbon-dioxide content, gradually develops, and the dogs will die from a sudden cardiac collapse in three hours. He believes the same thing happens in prolonged operations on the chest in human beings.

He credits Giertz of Sauerbruch's Clinic with suggesting that rhythmic insufflation of gas is the safest method of anesthesia. The author continued Giertz' experiments and with Anderson developed an anesthetic machine for the rhythmic insufflation of gas to human beings. For description of this apparatus the reader is referred to the original article. With this apparatus the patient's respiration is kept going, he is in a condition of absolute muscular relaxation and needs a smaller amount of oxygen.

Patients are given large doses of morphine, codeine, and atropine before operation. The pharynx, larynx, trachea, and bronchi are anesthetized with pontocaine. The patient is examined with the bronchoscope, his secretions are aspirated, and the bronchus on the diseased side is blocked with a small gauze tampon moistened with pontocaine solution. A thin silk thread attached to the tampon is brought out through the bronchoscope, passed through a metal spiral, and attached to a thin steel probe. The spiral and probe are passed through the bronchoscope and pressed against the tampon and the bronchoscope is removed. An intratracheal tube with an inflatable balloon is then passed into the trachea in such a manner that the steel probe remains inside of the tube. Nitrous-oxide and oxygen is administered to the patient and after ten minutes rhythmic ventilation is started. Small quantities of cyclopropane may be added. After a few minutes the machine takes over the breathing of the patient, the tidal volume, respiratory rate, and pressure being regulated by the anesthetist.

The author reports 94 anesthesias for intrathoracic operations with 27 deaths, 2 of which occurred during operation. He claims that this automatized type of breathing is the only method that gives a type of respiration which is similar to normal breathing when the chest is wide open on one or both sides. It also makes it possible to decrease the amount of oxygen in the gas mixture without the occurrence of anoxemia to such an extent that nitrous oxide can be used as the basic anesthetic agent.

JULIAN A. MOORE, M.D.

SURGERY OF THE ABDOMEN

ABDOMINAL WALL AND PERITONEUM

Dunphy, J. E.: The Diagnosis and Surgical Management of Strangulated Femoral Hernia. *J. Am. M. Ass.*, 1940, 114: 394.

Three factors contribute to the high mortality of strangulated femoral hernia: delayed treatment, the old age of many of the patients, and improper surgical management. In the author's series the correct diagnosis was established prior to admission to the hospital in only 57 per cent of the cases. In many instances both patient and physician were unaware of the presence of a hernia. In others a long recognized hernia was dismissed as a possible cause of the symptoms because there was no local tenderness or pain in the groin. Less than half of the patients complained of pain in the hernia, and exquisite tenderness over the hernia was also the exception rather than the rule. It should be axiomatic that whenever a patient complains of vague gastro-intestinal symptoms, particularly abdominal pain and vomiting, the possibility of a strangulated femoral hernia must be considered.

The author mentions several valuable technical points. A local injection of the peripheral nerves with procaine or metycaine provides the most satisfactory anesthesia. The inguinal approach gives the best exposure of the sac and its contents; an abnormal sac or obturator artery is more easily recognized through this incision, and if resection of the intestine is necessary it can be performed with an adequate exposure and without traction on the mesentery. One should open the peritoneal cavity before handling the sac because otherwise a Richter's hernia may be reduced during manipulation and a necrotic segment of bowel be overlooked. If manipulation and division of Gimbernat's ligament do not release the hernia the inguinal ligament must be partially or completely divided. However, if the inguinal ligament is cut transversely, the fascial edges may retract so far that successful reconstruction cannot be carried out. The incision through the ligament, therefore, should be staggered or diagonal. After the hernial sac has been dealt with, the ligament can be reunited. A flap of fascia taken from the upper edge of the external oblique muscle serves as an excellent reinforcement. As in a McArthur repair of an inguinal hernia, the medial end of this strip of fascia is left attached and the free end is passed under the cord or round ligament and sutured to the reunited inguinal ligament with interrupted stitches of fine silk. The ligament thus reconstructed is a sound structure which can be utilized in the usual repair.

AUGUST JONAS, JR., M.D.

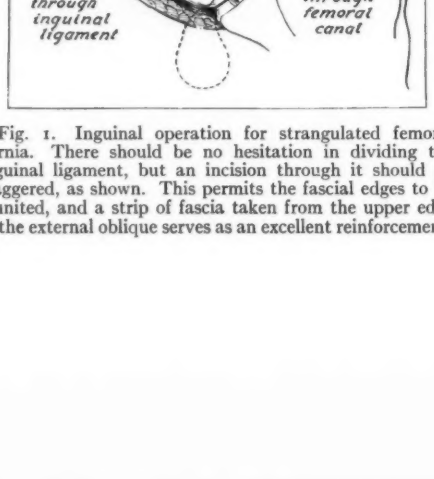

Fig. 1. Inguinal operation for strangulated femoral hernia. There should be no hesitation in dividing the inguinal ligament, but an incision through it should be staggered, as shown. This permits the fascial edges to be reunited, and a strip of fascia taken from the upper edge of the external oblique serves as an excellent reinforcement.

GASTRO-INTESTINAL TRACT

Vitkin, S. F.: Motor Functions of the Stomach After Resection. *Ann. Surg.*, 1940, 111: 27.

Seventy-four patients who had been subjected to gastrectomy for various conditions (Table I) were studied clinically and roentgenographically to determine the status of their gastric motor function. The gastric resections had been performed by the Billroth II method or some modification thereof.

TABLE I.—DISTRIBUTION ACCORDING TO DIAGNOSIS

Diagnosis	No. of cases
Cancer of the antrum	9
Cancer of the body of the stomach	12
Ulcer of the antrum	6
Pyloric ulcer	4
Ulcer on the lesser curvature in the region of the angle	18
Ulcer on the lesser curvature above the angle	14
Duodenal ulcer	2
Peptic ulcer	8
Gunshot wound of the stomach*	1
Total	74

*The patient with the gunshot wound was operated upon eighteen years ago, but for the last two years had been under the author's observation.

From these observations, the author arrived at the following conclusions:

As a rule, the stomach resected by the Billroth II method shows a rhythmic evacuation. This type of evacuation is observed both on resection by the classic method of Billroth II or by its Hacker-Eiselsberg or Kronlein-Reichel modifications.

In order to obtain rhythmic evacuation from a stomach resected by the Billroth II method, there

is no need to complicate this operation by further modification, e.g., the operation by Finsterer, Bal, Goetze, or others.

The type of evacuation obtained does not depend upon the extent of the resected region; the rhythmicality of evacuation is observed on subtotal gastrectomy.

There is no difference between the types of evacuation obtained in stomachs resected by the Billroth I and in those resected by the Billroth II method.

At present there are no data which would substantiate the belief in the formation of a sphincter in the anastomosis region after gastrectomy. Following resection by the Billroth II method, we consider such a formation to be quite impossible.

The periodic closing and opening again of the anastomosis are explained in the main by peristaltic contractions and distentions of the efferent intestinal loop nearest the anastomosis.

Gastric tone after a partial gastrectomy becomes normal in time; a hypotonic or atonic stomach becomes normal in tone.

Spasms of the anastomosis after gastrectomy undertaken for cancer present an early symptom of recurrence of the cancer in the region of the anastomosis.

After gastrectomy, most patients exhibit hyperplastic gastritis, though without any subjective manifestations.

After gastrectomy, chronic jejunitis follows, also without clinical manifestations.

Normal evacuation of the stomach resected by the Billroth II method or by its Hacker-Eiselsberg modification is in complete accord with the general condition of good health which gradually improves with the passing years. SAMUEL H. KLEIN, M.D.

Douglas, D. M., and Mann, F. C.: The Gastro-Ileac Reflex: Further Experimental Observations. *Am. J. Digest. Dis.*, 1940, 7: 53.

The activity of exteriorized loops of jejunum, ileum, and colon in continuity in trained dogs was studied in relation to feeding. A prompt motor response following feeding was noted in both the jejunal and the ileac loops, the response occurring more rapidly in the jejunal than in the ileac loops. Moreover, in an animal in which two exteriorized loops of small intestine at different levels were prepared, the motor response constantly appeared in the loop at the higher level before appearing in the lower loop.

Feeding by a duodenal fistula gave as constant results as feeding by mouth. Section of the intestine orad to the loop and re-anastomosis in such a way as to prevent at least immediate union of the muscular coats and the intrinsic enteric plexuses, did not prevent the occurrence of the motor response. A constant motor response was noted after feeding in the distal part of the colon but not in its proximal part.

The findings are taken to suggest that following the ingestion of food, a wave of activity traveling at the rate of about 1 cm. per second passes down the length of the small intestine. The gastrocolic reflex does not appear to be a part of this excitatory process. It is suggested that the term gastro-ileac reflex is not sufficiently inclusive.

Jenner, A. W. F.: Pernicious Anemia and Carcinoma of the Stomach (Pernizioese Anaemie und Magenkarzinom). *Acta med. Scand.*, 1939, 102: 529.

The relation of pernicious anemia and carcinoma of the stomach has given rise to an extensive literature which expresses four different opinions: namely, (1) that there is no connection between the two conditions, (2) that carcinoma of the stomach causes pernicious anemia, (3) that pernicious anemia causes gastric carcinoma, and (4) that the two diseases have a common cause. In search for an answer to this problem, a series of 181 patients with pernicious anemia were carefully studied for concomitant gastric lesions. In 8 of these gastric cancer was also found. This figure definitely exceeds the average incidence of carcinoma of the stomach and indicates a relationship between these conditions. Malignant neoplasms of other organs occurred in this series with only their normal incidence. These findings were confirmed by a further study of autopsy protocols in 76 fatal cases of pernicious anemia.

Chronic gastritis, with or without atrophy of the mucosa, is a regular accompaniment of both gastric carcinoma and pernicious anemia. The author believes that the gastritis is the primary condition, and that it predisposes to both the malignancy and the primary anemia. Because of the tendency of patients with pernicious anemia to acquire carcinoma of the stomach, they should be followed up very carefully, and re-examined at least every two months. They should be questioned closely for digestive symptoms, and studied roentgenologically as soon as such symptoms appear. The possible effect of liver therapy in correcting the gastritis and preventing the subsequent carcinomas will have to be determined by further study.

LEO M. ZIMMERMAN, M.D.

Madding, G. F., and Walters, W.: Lymphosarcoma of the Stomach. *Arch. Surg.*, 1940, 40: 120.

Because of the chaotic state that exists in the classification of sarcomas, the authors used the classification of sarcomas of the gastro-intestinal tract suggested by Ewing, namely: (1) spindle-cell myosarcoma, (2) miscellaneous round-cell or mixed-cell alveolar sarcoma, and (3) lymphosarcoma.

The spindle-cell myosarcoma is the type which is likely to be bulky, cystic, or solid; it may project into the peritoneal cavity or lumen of the stomach; it is non-infiltrating and is late in metastasizing.

Tumors of the miscellaneous round-cell type constitute a group about which little is known and, for this reason, probably do not deserve being classified as a separate variety.

Lymphosarcomas constitute the largest and most important group. There are two varieties which

differ in the cell type from which the tumors arise: the reticulum-cell sarcoma which develops from the reticulum cells of the germ centers of the follicles and pulp cords, and the malignant lymphocytoma or small round-cell lymphosarcoma, which develops from the lymphocytes.

The authors made an attempt to divide lymphosarcomas of the stomach as nearly as possible into the two groups: (1) reticulum-cell sarcoma (large round-cell lymphosarcoma), and (2) malignant lymphocytoma (small round-cell lymphosarcoma). They attempted to analyze the former clinically and morphologically, and to compare it with malignant lymphocytoma. Although this differentiation is not commonly made, it is practical and of clinical importance, for it has been noted that the response to roentgen therapy of the two types is variable.

The material used for study consisted of all specimens of sarcoma of the stomach available for study at the Mayo Clinic. There were 67 such cases.

The causation of lymphosarcoma of the stomach is unknown. A review of the speculations that have been offered will not be made as there was nothing derived from this study to add to existent theories.

The typical morphological picture of reticulum-cell sarcoma was one in which the lymph follicles were invaded and destroyed by large, pale cells, with nuclei of bizarre configuration, most of which were round, oval, reniform, or horseshoe-shaped. These nuclei were from two to three times the size of those seen in the malignant lymphocytoma. The cells were larger than immature lymphocytes and some evidence of phagocytosis was observed. Nucleoli were not prominent and the chromatin was diffusely dusted throughout the nuclear substance. The cytoplasm was somewhat eosinophilic and was considerable in amount.

The infiltrative quality of the tumor cells was a notable feature, and the muscular tissues as well as the capsules of the involved lymph nodes were frequently penetrated and destroyed. In some sections, invasion of the blood vessels was also noted. The structure of the involved lymph nodes was identical with that of the primary tumor in the stomach.

Tumors which might be confused with reticulum-cell sarcoma are: malignant lymphocytoma, Hodgkin's disease, very cellular carcinoma, endothelioma, hyperplastic non-caseous tuberculosis, and giant-follicle lymphoma (giant-follicle hyperplasia).

The malignant lymphocytoma or small round-cell lymphosarcoma is a tumor in which the involved lymphoid tissue is destroyed by lymphocytes, usually immature, with invasion of the capsule and adjacent tissues. It may or may not be associated with lymphatic leucemia. Very little fibrosis and no eosinophilia is the rule. If plasma cells, eosinophils, and normal lymphocytes are found, the existence of an inflammatory lesion must be considered.

At times, it is impossible to differentiate absolutely a very cellular carcinoma from a reticulum-cell sarcoma. Alveolar and glandular arrangements, the relationship of the long axis of the cells to the strands of connective tissue, the presence and size of the nucleoli, and the presence of mucus in the tumor are factors aiding in this differentiation.

An endothelioma of the lymphoid tissue at times may be indistinguishable from reticulum-cell sarcoma. The endothelial cell is a large flat cell with a large oval nucleus, but it may assume many shapes when found in the tumor. These cells are often found arranged in sheets or cords, and tumors arising from them are not only very rare but are much less malignant than sarcomas. There is often a definite relationship of the tumor cells to the endothelium of the sinuses and blood vessels. This tumor is rather radiosensitive and, thus, greatly in contrast to the reticulum-cell sarcoma.

Chronic hyperplastic non-caseous tuberculosis (Beck's sarcoid), although rare, may offer a confusing differential diagnosis morphologically. It closely resembles reticulum-cell sarcoma, but the large endothelial-cell proliferation, the presence of giant cells, and the absence of lymphocytic hyperplasia are factors aiding in the diagnosis. In difficult cases resort may be made to inoculation of guinea pigs.

In giant-follicle lymphoma there is seen in both the cortex and the medulla a diffuse distribution of the germinal centers composed of pale, uniform cells of uncertain origin. The absence of necrosis, polymorphonuclear leucocytes, and phagocytosis serves to distinguish the condition from that of a purely inflammatory lesion. It is a relatively benign form of malignant lymphoma as noted by the dearth of mitotic figures, and is one of the group of tumors which is particularly radiosensitive. However, some patients having this lesion present the terminal picture of a patient who has lymphosarcoma.

Reliance on the incidence by age of the subject in reticulum-cell sarcoma of the stomach is as dangerous as in the case of gastric carcinoma. Reticulum-cell sarcoma of the stomach is a disease of later life, the average age of the patient being forty-six and seven-tenths years. Graphically, the peak of the incidence occurred between the ages of forty and forty-nine years, and 70 per cent of the tumors occurred between the fourth and seventh decades.

Sex played a part in the incidence of reticulum-cell sarcoma, men being in preponderance in the proportion of 6 to 1.

Reticulum-cell sarcoma was found to be situated most often on the lesser curvature and the posterior wall of the stomach, these being the regions in which the greater percentage of all malignant lesions of the stomach are found.

Sarcoma of the stomach presented no typical picture, and only a few of the patients afflicted gave what we know as the classical history for neoplastic involvement of the stomach.

Because of the proximity of the submucous plexus of nerves, pain is a very common feature. It was found to be present in all the cases of reticulum-cell sarcoma studied. This pain was either generalized over the abdomen, or, more often, was situated in the midepigastrium. In some instances the story

was typical of peptic ulcer. The pain, however, did not respond as well to the usual measures for the management of ulcers, and, in addition, the periodicity of pain which so often accompanies the latter lesion was absent. Some patients complained of belching, anorexia, epigastric nocturnal pain, and loss of weight and strength.

The duration of symptoms ranged in the cases of reticulum-cell sarcoma from two months to several years, but as a rule the course was shorter than that of malignant lymphocytoma and carcinoma. The average duration of symptoms in cases of reticulum-cell sarcoma in which the patients were found to be inoperable was thirty-seven months.

Gastric analysis (Toepfer's method) showed achlorhydria in 67 per cent of the cases of reticulum-cell sarcoma; normal acids were found in 20 per cent; and free acid was present, but in subnormal amounts, in 13 per cent.

Roentgenological examination failed to lead to the correct diagnosis in any of the cases, from which it is reasonable to conclude that, roentgenographically, there are no absolutely characteristic or diagnostic features of the lesion. The roentgenological diagnosis most often made was "carcinoma," but the roentgenographic examination was important as an index to the operability of the lesion.

Sixty-five per cent of the patients with reticulum-cell sarcoma had metastatic lesions as contrasted with 70 per cent of those with malignant lymphocytoma.

Surgical treatment has relatively more to offer to patients having sarcoma of the stomach than to those having carcinoma. Until the advent of radiation therapy, the treatment was the same for both conditions, namely, an attempt at radical extirpation.

In comparing the figures of the group of patients having reticulum-cell sarcoma with the group having malignant lymphocytoma, the authors found that the latter have the better life expectancy. The patients having malignant lymphocytoma who were treated with surgery alone had an average life of five and six-tenths years postoperatively, as contrasted with three and six-tenths years for the group treated by surgery followed by radiation. In the group of patients having malignant lymphocytomas, 56 per cent were still living when last heard from. Two of these patients were living and well fourteen years postoperatively, and 1 died seven years postoperatively of pyelonephritis; at necropsy no evidence of the tumor was found. For only 1 of the patients with a fourteen-year cure, was roentgen therapy used as an adjunct to surgery in the treatment.

The authors believe that a patient having malignant lymphocytoma (small round-cell lymphosarcoma) has a better prognosis than a patient having reticulum-cell sarcoma.

Fifty-six per cent of the patients who had malignant lymphocytomas are still living, as compared with 41 per cent of the patients alive who had reticulum-cell sarcomas. Eighteen per cent of the patients who had leiomyosarcomas and 62 per cent of those who had fibrosarcomas are still living. The number of patients in this series is perhaps too small to permit formation of any statistical conclusions.

The authors conclude that malignant lymphocytoma is an uncommon condition but that in contrast to the general opinion held, reticulum-cell sarcoma and lymphocytoma appear to have a better prognosis than the group consisting of leiomyosarcomas and fibrosarcomas. Reticulum-cell sarcoma and malignant lymphocytoma are as insidious in their development as carcinoma, and neither lesion seems to offer a greater probability of reaching the surgeon in an early and operable stage.

In the stomach, the radical operability was low, and differential diagnosis to distinguish the lymphosarcomas from carcinoma was impossible. On the basis of the histories at the clinic, it seemed safe to conclude that both reticulum-cell sarcoma and malignant lymphocytoma remain localized for some time. Thus, a radical cure by total extirpation is possible, and this should be the goal in every instance.

It seemed evident from the malignant lymphocytomas which were found to be inoperable that radiation played a part in prolonging the life of the patients. This, however, was not true in respect to the inoperable reticulum-cell sarcomas, of which there were only 2. It would seem, on the strength of this survey of a group of patients having sarcoma of the stomach, that it is highly desirable and practicable to perform an exploratory operation and to obtain a biopsy, even for patients in whom the clinical evidence points strongly to the presence of an inoperable growth. A differentiation of the two types of so-called lymphosarcoma may then be made and patients having malignant lymphocytoma (small round-cell lymphosarcoma) may be given the benefits of roentgen therapy.

Binotto, A.: Late Results of Fixation in the Treatment of Intestinal Invagination (Esiti lontani della fissazione nel trattamento dell'invaginazione intestinale). *Arch. ital. d. mal. dell'appar. digerente*, 1939, 8: 439.

Binotto states that most authors agree that it is advisable to complete the surgical treatment of intestinal invagination by fixing the intestine. Various methods have been described for the purpose, but no late results have been reported. In his cases, he has always fixed the cecum to the lateral abdominal wall and usually also the last loop of the ileum to the medial aspect of the ascending colon by means of some separate sutures. One of his patients continued to have pains two years after the intervention, and roentgen examination for determining the cause revealed, besides an appendicular disturbance, a marked mobility of the cecum and of the last loop of the ileum. Subsequent urgent operation during an attack of pain confirmed the diagnosis of appendicitis and showed that the intestinal portions which

had previously been fixed had recovered their normal mobility, while some of the silk sutures used for fixation were still present in the wall of the last loop of the ileum. This observation induced the author to re-examine the available 5 of his 8 cases to determine whether the same result could be demonstrated.

After the administration of opaque substance by mouth and by enema, the patients were examined in the erect and supine postures, and roentgenograms were taken of the various positions assumed by the involved parts of the intestine as a result of external manipulations. In every case, there was perfect mobility of the previously fixed loops with functional characteristics of a completely physiological nature. The data of the clinical examination were in full agreement with the roentgen findings.

This observation stands in direct opposition to the opinion of those authors who claim that fixation may create peritoneal adhesions that are capable of preventing the normal function of the intestine. In fact, fixation may be accepted not only as an innocuous but also as an advisable procedure; however, no exaggerated reliance should be placed on its efficacy in protection against the recurrence of the invagination. Its action can be considered as lasting only for a limited time, after which it must be admitted that the intestinal loops free themselves from the position in which they have been fixed.

RICHARD KEMEL, M.D.

Bottin, J.: The Rôle of Toxemia in High Intestinal Obstruction (Rôle de l'intoxication dans l'obstruction intestinale haute). *Rev. belge d. sc. méd.*, 1939, 11: 421.

Bottin defines high intestinal obstruction as obstruction at any point between the entrance of the biliary and pancreatic ducts and the upper part of the ileum. The severe symptoms resulting from such obstruction have been attributed to dehydration and demineralization, but the author points out that even greater degrees of dehydration and demineralization may be produced without intestinal obstruction and do not result in the same severe symptoms or cause death. From his experiments, he is convinced that there is another factor in high intestinal obstruction, and this is the absorption of a toxic substance. He allows that dehydration is an important factor in intensifying the toxemia, as it interferes with the neutralization and excretion of the toxic substances.

For many years the author has made blood analyses in experimental animals with high intestinal obstruction without isolating any substance or group of substances that could be considered to be the cause of the symptoms. Another method of demonstrating the presence of toxic substances in the blood is to transfer the blood from an animal with high intestinal obstruction to another animal. This may be done by blood transfusion, by establishing a crossed circulation, or by artificial symbiosis.

In transfusion experiments, the author has always tested the bloods of the donor and the recipient animal for compatibility; the recipient animal used was of approximately the same size as the donor; the recipient animal was bled just before the transfusion, and the blood withdrawn was replaced by the blood from the donor. In some experiments the recipient animal was dehydrated by inducing repeated vomiting for four or five days before the transfusion. In experiments in which the donor animal with high intestinal obstruction was in an almost moribund condition, but the recipient animal had not been dehydrated, the transfusion caused severe symptoms in the recipient—tachycardia, dyspnea, somnolence, anuria, and oliguria—but the animal survived.

When the recipient had been dehydrated, death resulted from the transfusion in every case; before death, the pulse was very rapid, the temperature below normal, the blood pressure very low, and respiration rapid; no urine was passed and very little was found in the bladder post mortem. Post-mortem examination, which was very complete, showed no organic lesion. If the recipient animals that had been dehydrated were given fluids by mouth and intravenous injection, or by subcutaneous injection just prior to the transfusion from an animal with high intestinal obstruction, the symptoms were less severe and the animals survived; oliguria was not marked. These experiments indicate the importance of dehydration in high intestinal intoxication. However, if the donor animals had been dehydrated without intestinal obstruction, the recipient animals showed no symptoms, except a temporary oliguria, which indicated that dehydration is not the chief factor in the symptoms of high intestinal obstruction, but that it intensifies the toxemia.

In another series of experiments the animals with high intestinal obstruction were given fluid in large quantities by subcutaneous or intravenous infusion; this prolonged life for many days and for several days the animals remained in good condition, developing the typical symptoms of high intestinal obstruction subsequently. When dehydrated recipient animals were given transfusions from such donor animals before symptoms developed in the donor, they showed very few symptoms; but when the donor animals had developed symptoms, transfusion caused severe symptoms and death in the recipient.

All these experiments indicate that high intestinal obstruction results in the accumulation of some toxic substance, in the blood; these substances are neutralized by the liver to a certain extent and excreted by the kidney; but the dehydration that is associated with high intestinal obstruction interferes with the elimination of toxic substances, and severe toxemia and death result. If fluids are supplied, the toxemia is reduced, but not indefinitely, as the toxic substances are present in such large amounts that they cannot be eliminated satisfactorily and finally overwhelm the organism.

In experiments in which a crossed circulation was established between animals with high intestinal obstruction and normal or dehydrated animals, and maintained for from twelve to sixteen hours, the

dehydrated animals developed typical symptoms, including marked oliguria, and often died; the normal animals survived. In some of these experiments it was noted that the animals with intestinal obstruction showed improvement when crossed circulation was established with normal animals.

In both the transfusion and crossed-circulation experiments, it was found that the development of the toxemia in the animals with high intestinal obstruction could be definitely delayed by exclusion of the pancreas from the obstructed intestine; but after about three weeks the amount of toxins in the blood had become sufficient to cause death of not only the animals with obstruction but also the recipient animals. While the pancreas is apparently the principal source of the toxins, the obstructed intestine itself and eventually the liver are also sources of the toxic substances. ALICE M. MEYERS.

Rodríguez Villegas, R., and Schena, A. T.: Multiple Carcinoids of the Small Intestine (Carcinoide múltiple de intestino delgado). *Semana méd.*, 1940, 47: 425.

According to Okinczic's statistics, based on 90,000 autopsies, tumors of the small intestine occur in 0.02 per cent of all fatal cases and form 3.1 per cent of all primary tumors of the intestines in general. Malignant tumors of the small intestine may be divided into three groups: carcinomas, sarcomas, and carcinoids.

The authors report a case of a carcinoid of the small intestine in a thirty-seven-year-old man. The tumor produced an intussusception. After a resection, a terminolateral anastomosis was performed with a Murphy button. As the pains recurred, and intestinal contractions became visible, a second operation was performed six and one-half weeks after the first. Disseminated tumors were found in various places between the duodenojejunal junction and the terminal portion of the ileum. After exteriorization of the tumor causing invagination, the abdomen was closed. The patient expired two weeks after the operation. The histological examination established the diagnosis of a carcinoid.

JOSEPH K. NARAT, M.D.

Ottenheimer, E. J., and Gilman, R. L.: Rupture of the Retroperitoneal Duodenum. *New England J. Med.*, 1940, 222: 251.

Traumatic rupture of the retroperitoneal duodenum is an exceedingly rare but serious abdominal condition. Fixation of this portion of the bowel just in front of the spine renders it particularly vulnerable to injury.

The authors report the case of a twenty-one-year old student who struck his right chest and abdomen on a diving board and felt immediate severe pain in the upper abdomen. Later there was radiation over the entire right abdomen. There was nausea at first; later, muscle spasm and tenderness were found in the whole right abdomen. Priapism was also present. The spine was not tender. The white cell count was 22,600 with 96 per cent polymorphonuclear cells. A catheterized specimen of urine showed a trace of albumin, granular casts, and from 3 to 8 red blood cells per high power field. Lateral films showed air in the retroperitoneal tissues surrounding the kidneys and along the iliopsoas muscle. A preoperative diagnosis of possible ruptured viscus was made.

At operation, which was carried out three hours after the injury, a small amount of free fluid was found in the peritoneal cavity and subserosal infiltration of a white frothy fluid was noted in the lower ascending colon, cecum, and terminal ileum. There was extensive retroperitoneal emphysema which seemed to extend all the way up on the lateral side of the ascending colon. The liver, gall bladder, right kidney, and bladder were normal. An incision in the peritoneum lateral to the cecum allowed a thin odorless fluid to escape. No intra-abdominal cause for the retroperitoneal emphysema could be found and the abdomen was closed without drainage.

The patient died thirty-six hours later. At autopsy, an extensive retroperitoneal cellulitis resulting from a perforation of the duodenum just below the junction of the horizontal with the descending portion was found.

Three factors are said to account for the high mortality: (1) failure to make a diagnosis sufficiently early to render proper treatment effective; (2) failure to recognize the condition at operation; and (3) the technical difficulties encountered in repairing the retroperitoneal duodenum and establishing adequate drainage of the retroperitoneal space.

Early diagnosis of rupture of the retroperitoneal duodenum is difficult because there is no peritonitis and the abdominal findings, aside from tenderness and slight muscle spasm in the right side, are not striking. Early vomiting is quite constant. Pain in the right abdomen and often in the area of the right kidney is severe and uninterrupted. Severe pain in the testicles as well as priapism have been reported. Emphysema of the lateral abdominal wall has been noted. The presence of gas in the retroperitoneal space should be readily demonstrable radiologically. Sperling and Rigler have indicated that gas in the retroperitoneal space can have only 3 origins: (1) artificial introduction; (2) the presence of a gas-forming organism; and (3) rupture of a hollow viscus having a retroperitoneal course. The first 2 causes can ordinarily be easily excluded.

Retroperitoneal emphysema has been found in many cases and may be very extensive. The intraperitoneal changes may be slight, or may consist of bloody or bile-stained fluid, signs of hemorrhage, and fat necrosis.

It is usually necessary to mobilize the upper ascending colon to gain exposure to the area ruptured. Drainage of the retroperitoneal space is imperative and is best accomplished through the loin. Knaggs believes that anterior drainage is useless. He advises an exploratory kidney incision with a wide exposure of the space. JOHN A. GIUS, M.D.

Crohn, B. B., and Yarnis, H.: Primary Ileocecal Tuberculosis. *New York State J. M.*, 1940, 40: 158.

About ten years after Robert Koch first stained and cultured the tubercle bacillus, many reports of cases of so-called primary intestinal tuberculosis appeared in the French and German literature. The majority of these cases were regarded as instances of primary tuberculous infiltration involving the ileocecal region of the bowel; the dissemination of the infection was not observed in the earlier ones.

Before the advent of roentgenography, involvement of the lungs was determined chiefly by physical signs. The cases reported were in nearly all instances cases which had been operated upon, with excellent local descriptions of the disease, but the general physical status of the patient had not been investigated thoroughly and bacteriological and animal inoculation tests had not been made.

Recent recognition of the greater frequency of nonspecific granulomatous processes of the entire alimentary tract and particularly of the terminal ileum makes it apparent that many of these cases had formerly been considered as tuberculous processes. With the recognition of granulomatous terminal ileitis and regional enteritis, as well as right-sided colitis, it becomes apparent that the number of patients with true primary intestinal tuberculosis seems to be diminishing. The authors, during eight years of investigation, encountered 130 instances of ileitis or regional colitis, and during this time saw very few proved cases of primary intestinal tuberculosis.

There are few figures in modern clinical medicine which attempt to state the incidence of primary intestinal tuberculosis and these may not be reliable. To summarize the literature, the opinions of bacteriologists vary from those of Calmette, who regarded the intestinal point of origin for human tuberculosis as the common one, to those who deny entirely the existence of intestinal tuberculosis. Only the pediatricians offer a very small incidence of true primary intestinal tuberculosis, most of the cases occurring in children below four years of age, in the milk-drinking period, and these of bovine origin and nature.

There has been a great tendency to confuse specific tuberculosis at the ileocecal junction with nonspecific granulomatous processes. The authors made a careful survey and review of 4,800 autopsies together with all the surgical material in the Mount Sinai Hospital during the twelve-year period from 1926 to 1938. In all this large material they have found only 8 cases which they accept as primary intestinal tuberculosis, according to both histological and gross structure. Seven of these 8 instances were culled from the general surgical pathological material and represent resections in active cases. It was found that almost all of these 8 cases occurred in young persons in the second and third decades of life. There were 4 males and 4 females. The pathological lesion presented as a shallow, discrete, multiple ulceration leading up to granulomatous reactions with localized mass formation. The gross and microscopic appearance was typical of the lesion of ileocecal, hyperplastic or ulcerous, tuberculosis. It is questionable whether anyone could differentiate by inspection the primary type of lesion from the secondary type of extension which occurs as a late complication or as a terminal event in pulmonary tuberculosis. Grossly, the lesion cannot always be differentiated from non-specific granulomas. The discrete ulcerous type and that involving only the cecum were quite characteristic of primary tuberculosis. In all cases the mesenteric lymph nodes were enlarged, firm, and definitely pathological, while in only 1 instance was true caseation present.

Fig. 1. Hypertrophic cecal and ileocecal tuberculosis.

SYMPTOMATOLOGY

The duration of the active symptoms varied from two weeks to eight years, and averaged one and one-half years. Diarrhea, low-grade temperature, and colicky abdominal pain associated with defecation constitute the outstanding clinical features. Weight loss was considerable and secondary anemia was fairly constant sooner or later. Almost all the cases exhibited a mass in the lower right abdominal quadrant. The presence of anal fistulas is an important confirmatory sign which reveals the true nature of the disease.

Roentgenographically the two types, specific and non-specific, cannot be completely differentiated. The typical "string-sign" of true terminal ileitis is rarely seen in tuberculosis. Strictured areas are typical of tuberculosis and do not occur in regional colitis.

The prognosis of ileocecal tuberculosis even after resection was not good. Two patients died, 1 was not benefited, and 3 suffered extensive recurrences. In only 2 instances were favorable results achieved to date.

Bacteriological verification together with typical histological evidence of miliary tubercle formation and with mononuclear and giant cells is regarded as classical evidence of bowel tuberculosis. The authors placed their greatest reliance in diagnosis upon the histological evidence of true tubercle formation with the presence of giant cells and caseation. In 2 instances only were acid-fast organisms seen in slides. The authors believe that the successful inoculation of guinea pigs or rabbits with suspected tuberculous material offers the ultimate proof of the cause of this disease.

JOHN W. NUZUM, M.D.

Adams-Ray, J.: On the Occurrence of Double Processus Vermiformis. *Acta chirurg. Scand.*, 1940, 83: 385.

The author has found 27 cases of double vermiform process described in the literature. He considers 18 of these to be adequately verified and 9 to be probable instances of duplication. Each case is classified under one of three main groups.

The majority of the 8 cases which constitute Group I were newborn fetuses. In each of these, two vermiform processes were found associated with a vesico-intestinal fistula, incomplete development of the large intestine, and atresia of the anus. One other infant had all but the vesico-intestinal communication and is classified as a transitional form between Group I and Group II. Kermauner attributed this teratological triad to arrested development just prior to the fourth week of embryonic life. His concept, favored by the author, assumes that the cloaca gives origin to the distal ileum, the cecum, the colon, and the rectum. Normally two lateral folds protrude into the cloaca and, developing caudally, separate it into the colon and bladder. A developmental arrest in this process causes the vesico-intestinal fistula. The tissue from which the vermiform process arises is thought to exist in two parts, one on each side of the cloaca. Normally, as the lateral folds which divide the cloaca unite, this tissue fuses and gives origin to a single vermiform process. When these two folds are prevented from uniting by incomplete division of the cloaca each develops into a vermiform process.

Group II is composed of (1) 8 cases of double vermiform process discovered during surgical operations, and (2) 3 cases wherein both the process and the cecum were duplicated. In the majority of these no other anomaly was apparent.

Group III includes 7 cases in which the process was abnormal in some degree. This abnormality varied from a double origin through a common apical lumen with a Y-shaped division at its base to a double lumen.

Six additional cases are mentioned which may be instances of duplication. Four of these were cases in which a vermiform process was found at operation after a previous appendectomy. Two cases are thought to have resulted from a gangrenous division of the process near its middle after the apex had become adherent to the cecum during an earlier attack of appendicitis.

Double appendix, although a rare anomaly, is probably the most common type of duplication of the gastro-intestinal tract. It should be kept in mind by the surgeon and the medicolegal expert.

EDWARD W. GIBBS, M.D.

Morse, L. J., and Rader, M. J.: Acute Appendicitis. *Ann. Surg.*, 1940, 111: 213.

This article is a survey of 8,727 cases of acute appendicitis operated on at the Jewish Hospital in Brooklyn during the twenty-year period prior to 1935 with a mortality rate of 2.15 per cent. This figure compares favorably with the mortality rates of 16 clinics and hospitals in this country and abroad.

That the number of deaths from this disease varies directly with the severity of the pathological process and the extent of peritoneal involvement is well known. This is also confirmed by the mortality rates of 0.5 per cent for 6,464 cases of acute unperforated appendicitis; 1.56 per cent for 1,024 cases of perforation without gross peritoneal involvement; 6.03 per cent for 663 cases with abscess formation; 6.54 per cent for 336 cases with local peritonitis; and 32.5 per cent for 240 cases with diffuse peritonitis.

The greatest single factor to affect the prognosis in acute appendicitis is early operation. As long as the pathological process remains limited to the appendix, the mortality rate will be kept at a minimum. The importance of this factor is emphasized by the low mortality rate of 0.59 per cent which occurred among the cases operated on within twenty-four hours after the onset of the symptoms. A steady increase in the number of deaths follows delayed operation for each successive day during the first five days of the disease.

Although appendicitis was most frequently encountered in adolescent and early adult life, its fatalities were more common among patients under eleven and over forty years of age.

Leucocytosis and fever were usually found to be only moderate. In general, those cases with fever higher than 102° F. were complicated by some degree of peritonitis. No correlation between the leucocytic response and the temperature elevation could be shown. A majority of the cases presented a definite elevation in pulse rate.

A history of previous attacks, elicited in 30 per cent of the cases, could not be correlated with any appreciable change in the relation of the duration of symptoms in the present attack to the type of pathology encountered at operation.

The use of spinal anesthesia resulted in better relaxation and fewer postoperative respiratory complications.

The authors favor the McBurney approach to the appendical region and reiterate many of the advantages of this muscle-splitting incision.

Inversion of the stump with the consequent apposition of serosal surfaces is recommended unless contraindicated by cecal-wall damage. The danger of cecal-wall abscess following inversion of a ligated stump is thought to be more mythical than real.

Nearly 45 per cent of the cases with survival had been drained in accordance with the opinion that drainage should be employed in every abscess case, in every contaminated case of retroperitoneal appendix, in any case in which the integrity of the cecal wall is doubtful, in cases of peritonitis in which pus is expected to ensue, and in every difficult appendectomy in which contamination is possible.

The complications which were encountered are merely classified as either secondary to appendicitis

or resulting from the operative procedure, and are to be analyzed in detail in a subsequent communication. EDWARD W. GIBBS, M.D.

LIVER, GALL BLADDER, PANCREAS, AND SPLEEN

Moore, S.: Cholecystography: Appraisal After Fifteen-Year Period. *Northwest Med.*, 1940, 39: 43.

Among the chief additions to the substances used in cholecystography since Graham and Cole's publication has been their own contribution of phenoltetraiodophthalein (iso-iodeikon) which, because of its power of staining the blood serum, is an effective substance for estimating the excretory power of the liver. There does not appear to be sufficient advantage in the magnesium or cesium salts of the halogenated phenolphthaleins to warrant their substitution for the sodium salt or its isomer.

The author classifies gall bladders as either "normal" or "pathological" instead of using the terms "functionless" and "impaired function," as employed by many others. These terms are objected to for the reason that the functions of the gall bladder are not known. Cholecystography is a measure only of the ability of the gall bladder to fill, to empty, and to concentrate its contents.

Cholecystography is contraindicated in advanced disease of the liver from any cause, as the elimination of the dye might throw an additional strain on the liver. Intravenous cholecystography should never be carried out in the presence of cardiac disease if there is low blood pressure. Disorders of the alimentary tract characterized by nausea, vomiting, or diarrhea constitute an absolute contraindication to the oral method of cholecystography. For unknown reasons, cholecystography fails in the late months of pregnancy.

The interpretation of pathological intravenous cholecystograms. Non-visualization of the gall bladder is the most frequent finding in intravenous cholecystography and is a very certain sign of a diseased organ, provided that the patient is neither jaundiced nor has an enlarged liver, and is not in the late months of pregnancy. Non-visualization will also occur in cases of occlusion of the cystic duct, and it has occurred in cases of obstruction of the common duct. Faint visualization is a confusing sign, and one must be very careful not to fall into diagnostic error based on this finding. Delayed concentration, by which is meant non-visualization at the fourth hour, faint visualization at the eighth hour, and the maximum density at the twenty-fourth or a later hour, is believed to be a very certain sign of diminished concentrating power of the mucosa of the gall bladder. The differential diagnosis between organic filling defects in the gall bladder and abnormal shadows produced by the intestinal contents, usually gas, can be greatly facilitated by the use of pitressin. It is frequently possible to demonstrate the presence of non-opaque or cholesterol stones in the gall bladder by means of cholecystography.

The interpretation of oral cholecystograms. When stones are noted after the oral test, it is just as conclusive evidence of their presence as their being found after intravenous cholecystography administration. Non-visualization, faint visualization, and delayed concentration cannot be relied on in estimation of the condition of the gall bladder for the reason that the quantity and rate of dye absorption from the alimentary tract are unknown. Intraluminal filling defects may be demonstrated.

The relative merits of intravenous and oral cholecystography are subject to a wide divergence of opinion. The oral method is undoubtedly simpler and less troublesome to the patient. From the literature it appears that the opinion among radiologists is equally divided as to the value of oral and of intravenous administration. The author is of the opinion that the results of the intravenous method are more reliable. If the findings with the oral method are dubious, the test should be repeated by means of the intravenous method. Apparently, the possibility of reactions following the intravenous method has militated against its employment.

Analysis of the results in 895 consecutive cholecystectomies done between January, 1924, and December, 1937, revealed the following:

In 134 instances cholecystography was omitted, the usual reason being an obvious diagnosis or acute illness.

Preliminary films revealed gall stones in 17 cases, and they were found at operation in every instance. In 645 intravenous cases there were 21 errors, and in 99 oral cases there were 4 errors. In the grand total of 895 cholecystectomies, the preoperative diagnosis was confirmed by pathological examination in 97.21 per cent of the cases.

SAMUEL H. KLEIN, M.D.

Voelcker, F.: Indications for Surgical Intervention in Gall-Stone Disease (Indikationen zum chirurgischen Eingriff bei Gallensteinerkrankungen). *Karlsbader aerztl. Vortr.*, 1939, 16: 134.

While from a general point of view so-called gall-stone carriers offer no indication for surgical intervention, the question of an early operation arises in cases of gall-stone disease in which the patients suffer merely from occasional colic without other serious symptoms. The decision to operate must depend upon each individual case, and all symptoms as well as the seriousness of the attacks, the danger of morphinism, the general constitution, the result of internal treatment, such as Karlsbad cures, and social indications must be carefully considered. At the same time it should not be overlooked that frequently an evaluation of the prognosis is extremely difficult, and that a sudden turn for the worse may occur and manifest itself in increasingly serious and frequent colic, accentuation of the nutritional disease, and increase of the pathologico-anatomical changes resulting from chronic inflammation, all of which symptoms may assist in determining the indication for surgical intervention.

Operation appears more urgent in cases of acute cholecystitis with obstruction of the excretory tract. Considering the danger of recidivation and the sequelæ to be expected, operation is urgently recommended in cases with acute attacks which have been treated conservatively with favorable results, since surgical intervention is less dangerous after the attack has subsided than during the attack itself. If the attack leads to perforation and biliary peritonitis, which is particularly difficult of diagnosis when the perforation takes place retrohepatically at the basal portion of the gall bladder, a prompt surgical intervention offers the only possible chance for recovery. In very serious complications of acute cholecystitis with obstruction of the excretory tract and ascending cholangitis, operative help, if at all possible, usually comes too late.

Surgery is also indicated in chronic gall-bladder empyema. Likewise in cases of dropsy and automatically stenosed gall bladder, cholecystectomy is recommended in young patients. While surgical intervention is not absolutely indicated in the presence of small calculi in the choledochus which may cause a temporary occlusion of the papilla, cases in which movable or tightly lodged stones are causing continued obstruction in the choledochus require surgical intervention unconditionally. Postponement involves danger to the patient's life. Infections associated with such conditions make the therapeutic outlook for recovery still more hopeless.

Finally, attention is called to gall-stone ileus, the diagnosis of which is usually revealed only during the course of the operation.

(Welcker). Hilda H. Wullen.

Lam, C. R.: The Present Status of Carcinoma of the Gall Bladder. *Ann. Surg.*, 1940, 111: 403.

The author presents a study of 34 clinical cases of primary carcinoma of the gall bladder. From this study it was found that only 1 of 34 patients was cured, and correct pre-operative diagnosis was made in only 4 instances.

The writer believes it is reasonable to estimate that approximately 6,500 persons in the United States died of primary carcinoma of the gall bladder in 1936. This figure is 4.5 per cent of the total deaths from malignancy, or about one-half the percentage estimated by Graham for 1926. The disease is more common in women with cholelithiasis.

In an attempt to clarify the clinical diagnosis of carcinoma of the gall bladder, the author listed the following facts:

Primary cancer of the gall bladder is a disease of the "cancer age," the youngest patient being forty-six years old, the oldest eighty-two. Eighty per cent of all patients will be over fifty years of age. Cooper reported the condition in a patient twenty-eight years of age, the youngest patient in the recent literature. The disease occurs in the ratio of about 3 to 1 when its incidence in females and males is compared. The disease may occur rather acutely. The most frequent chief complaint is pain in the right upper quadrant of the abdomen. Other complaints are jaundice, nausea and vomiting, pain in the back, palpable tumor, weight loss, constipation, and indigestion. These may all be present. Pain was almost a constant symptom in 88 per cent of the patients. Slightly more than half of the patients were jaundiced. Cooper reported weight loss in 95 per cent of his cases. A palpable tumor in the gall bladder was elicited in 12 instances. The liver was palpable in 16 patients. Marked anemia in cancer of the gall bladder is not commonly present. Diagnostic transduodenal biliary drainage was of little assistance in making the diagnosis.

In 9 patients cholecystograms were made. All of these showed non-filling of the gall bladder and 1 patient revealed the presence of gall stones. Rarely, carcinoma of the gall bladder may be strongly suspected when the barium meal demonstrates a fistulous connection between the gall bladder and the stomach or colon. Two such cases with correct preoperative diagnoses were described by Spitzenberger. In summary, we may say that non-filling of the gall bladder, with or without positive stone shadows, is to be expected in primary carcinoma of this organ.

Operative treatment. In 3 cases of this series cholecystectomy was performed but carcinoma was not suspected at the time of the operation. In 6 instances a deliberate attempt to remove the carcinoma was made; these patients all died. In 1 patient malignancy in the gall bladder was not suspected until routine histological examination was made. This patient has survived five years. Finsterer has performed partial hepatectomy with cholecystectomy in 46 cases with 1 survival.

It is well established that the frequent occurrence of gall stones with primary carcinoma of the gall bladder suggests an etiological relationship. The difficulty in diagnosis and the comparatively hopeless prognosis in the majority of cases is stressed.

John W. Nuzum, M.D.

Wheeler, Sir W. I. deC.: An Unusual Case of Obstruction of the Common Bile Duct (Choledochocele?). *Brit. J. Surg.*, 1940, 27: 446.

A case of obstruction of the common duct in a man of sixty-five years is reported. The patient had been operated upon previously for repeated attacks of biliary colic and jaundice. On this occasion the common bile duct was found dilated, but no stone or other cause of obstruction was revealed. The symptoms continued, and the abdomen was reopened. The gall bladder could not be found among dense adhesions, and may have been removed at the previous operation. The common duct was exposed and was seen to be greatly dilated. No stone could be felt. The pancreas and duodenum appeared normal.

The duodenum was then opened and the cause of obstruction at once became apparent. A small tense cyst, about the size of a cherry, occupied a position in or about the orifice of the common duct. The cyst was incised, and the field of operation immediately

became flooded with bile. The patient was kept under observation for five years. He had no recurrence of pain or jaundice, and died subsequently of some medical ailment, when approaching eighty years of age.

The author suggests the theory that a condition similar to ureterocele may occur at the orifice of the common bile duct.

In all obscure cases of biliary obstruction in the presence of a dilated bile duct, search should not be abandoned until the duodenum has been opened and explored. SAMUEL H. KLEIN, M.D.

Baldacci, G., and Miano, S.: The Purified Secretin Test in Pancreatic and Biliary Functional Diagnosis (La prova della secretina purificata nella diagnostica funzionale pancreatica e biliare). *Arch. ital. d. mal. dell'appar. digerente*, 1939, 8: 462.

The study of the qualitative and quantitative modifications of the external secretion of the pancreas has been carried out with the object of finding a more precise measure of the exocrine functions of the gland. The study of the diastatic activity in the feces, blood, and urine has not been satisfactory for modern clinical needs. The ideal secretory excitant for this purpose should be the duodenal hormone first isolated by Bayliss and Starling. As in other secretory tests it should be possible to represent graphically the volume and diastatic activity of the pancreatic secretion. Such studies have been rendered possible by the purification of the hormone for intravenous use (first done by Penau and Simmonet in 1925). The preparation introduced by Agren (pancreotest) was used; 4 mgm. of this provoke the secretion of ¼ liter of pancreatic juice. Agren and his collaborators have established the normal values by numerous experiments.

The present authors have adopted the methods of Chiray and his coworkers, who, after introducing an Einhorn tube and injecting into the duodenum 33 per cent magnesium sulfate, also study the A, B, and C fractions of bile. After the intravenous injection of pancreotest the secretion of a slightly viscous, pale golden-yellow fluid is stimulated which is collected in 5 fractions: the first two at intervals of ten minutes, and the three successive specimens at intervals of twenty minutes. The trypsin and lipase values of each fraction are determined. The findings are recorded as curves; the biliary secretion is determined by the method of Meulengracht.

The author then reviews the literature on the incidence of simultaneous involvement of the biliary tract and pancreas. Barber found at operation on 35 patients with cholecystitis that the pancreas was normal in only 36 per cent. Schmieden and Siebening found that the biliary tract was infected in 181 of 308 cases of chronic pancreatitis.

The authors used the secretin test in 5 cases of diabetes and 6 cases of cholecystitis. They found that in the diabetics the external secretion of the pancreas was reduced in amount. The Meulengracht curve as concerns biliary function was not constant or characteristic in the diabetics studied. Among the patients with gall-bladder disease the pancreatic function was disturbed. With subsidence of the gall-bladder infection the pancreatic function returned to normal. In 3 cases of cirrhosis of the liver there was a diminution in the functional capacity of the pancreas, especially in its diastatic activity.

The authors conclude that the purified secretin method constitutes a notable advance in our methods of studying the exocrine functions of the pancreas. The intravenous injection of pancreotest caused no noteworthy reactions. It also stimulated the flow of bile by direct action on the hepatic cells. JACOB E. KLEIN, M.D.

Ivanissevich, O., and Ferrari, R. C.: The Hypoglycemic Syndrome. Partial Pancreatectomy (Síndrome de hipoglucemia. Pancreatectomía parcial). *Bol. inst. de clin. quir.*, Univ. de Buenos Aires, 1939, 15: 1110.

The spontaneous hypoglycemic syndrome is characterized by a permanent hypoglycemia and a maximal fall of the blood-sugar level, coinciding with a nervous crisis characterized by various manifestations, chiefly of a maniac or depressive character. The term "hyperinsulinism" is based on a pathogenic interpretation of the condition. In some cases a circumscribed adenoma of Langerhans' islets may be found at autopsy, while in others probably a diffuse hypoplasia of the excretory apparatus of the pancreas is present.

A twenty-two-year-old man was complaining of somnolence, general debility, and amnesia. The attacks of somnolence or semi-consciousness lasted one or two hours. The clinical and roentgenological examinations revealed a tumor in the left side of the chest, occupying the lower portion of the pulmonary field and producing dysphagia, dyspnea, cough, and expectoration. A stone was revealed in the left kidney. The blood-sugar contents amounted to 41 mgm. per 100 c.cm. A sugar tolerance test was performed and one hour after the ingestion of 120 gm. of glucose, 357 mgm. of sugar were found in the blood; two hours after the test the blood-sugar contents amounted to 28 mgm. and after three hours, to 62 mgm. During a crisis the blood-sugar level fell to 20 mgm.

A diagnosis of paroxysmal hypoglycemia, caused by a spontaneous hyperinsulinism and probably due to an adenoma of the pancreas, was made. In addition, a mediastinal tumor, probably a fibroma, and a left renal calculus were diagnosed.

Under spinal anesthesia the pancreas was exposed and, as no adenoma was found, a partial resection of the organ was performed. The histological diagnosis revealed a hyperplasia of the Langerhans' islets and formation of minute adenomatous nodules of the excretory type. Two days after the operation the blood-sugar contents amounted to 110 mgm. and the following day, to 150 mgm. One month after the operation the blood contained 100 mgm. of sugar per 100 c.cm.

Similar cases have been described in the literature under the name of spontaneous hypoglycemia, dysinsulinism, hyperinsulinism, or endocrine adenoma of the pancreas. JOSEPH K. NARAT, M.D.

Dunphy, J. E.: The Early Diagnosis of Cancer of the Pancreas. *Am. J. Digest. Dis.*, 1940, 7: 69.

Cancer of the pancreas is an operable lesion when recognized early. Before the onset of jaundice, it is particularly difficult to establish the diagnosis. Important symptoms are persistent, inexplicable abdominal pain, radiating to the back, worse at night or when the patient is lying down, and weight loss of an unusually rapid nature. Unexplained, intractable diarrhea, persistent nausea unrelated to meals, or a peculiarly unbearable type of epigastric distress are uncommon complaints which, however, may suggest the diagnosis to the keen observer. Usually the x-ray examination is only of negative value in cancer of the pancreas, but there are three positive findings which should be looked for and which, if present, are of diagnostic import. These are a widening of the duodenal loop, pressure defects of the duodenum or pylorus, and, in cancer of the tail of the pancreas, pressure defects of the greater curvature of the stomach.

JOSEPH K. NARAT, M.D.

MISCELLANEOUS

McSweeney, D. J., and Wood, F. O.: Acute Abdominal Conditions Following Ovulation and Its Sequelæ. *New England J. Med.*, 1940, 222: 174.

Ruptured graafian follicle, bleeding corpus luteum, ruptured corpus hemorrhagicum, and corpus-hemorrhagicum cyst, with or without rupture, are conditions frequently overlooked in the differential diagnosis of acute lower abdominal pain in women.

Ovulation may cause pain in several ways. First, pain may be caused by rupture of the graafian follicle with the escape of follicular fluid or, at times, a few drops of blood from the follicle when the ovum is extruded—the so-called *Mittelschmerz* of the Germans. After the ovum has been expelled there may be pain as blood escapes through failure of the stigma to become sealed off as the corpus hemorrhagicum is forming. Later in the cycle there may be pain due to rupture of the corpus hemorrhagicum or to the formation of a corpus hemorrhagicum cyst, which may cause pain of itself or by rupture.

A study of the records at the Boston City Hospital showed that from 1926 through 1938, 257 patients were admitted to the main hospital with a chief complaint of abdominal pain due to ovulation or its sequelæ. Of these, 216 were operated on and 41, diagnosed as having ruptured graafian follicles or ruptured corpora hemorrhagica, were not treated surgically. Among the operated cases there were 20 (including 5 of corpus-hemorrhagicum cyst, 1 of which had ruptured) diagnosed correctly before operation, and 38 in which the sequelæ of ovulation were considered strong possibilities in the differential diagnosis, but with symptoms severe enough to warrant operation. Assuming the diagnosis to be correct in the 41 cases not operated upon, there were 61 correct diagnoses, which is considered to be an admirable record for a condition which simulates appendicitis and many pelvic disorders so closely, and of which Johnson, in 1930, after an exhaustive survey of the literature, found not a single case which had been correctly diagnosed.

This series, from 1926 through 1938, may be differentiated into 3 categories:

1. There were 74 patients, including 15 discharged without operation, who could be considered as having ruptured graafian follicles. The 59 operative cases in this group were characterized by an absence of free blood in the peritoneal cavity, but by evidence of recent ovulation in the form of a distinct unruptured corpus hemorrhagicum. In this group nothing was done surgically to the ovaries. The unoperated cases showed mild symptoms which cleared up a few hours after entry.

2. There were 165 cases of ruptured corpus hemorrhagicum, of which 139 were operated on. The operated cases showed evidence of free blood in the pelvis, from 1 to 120 c.cm. of serosanguineous fluid. The majority of these cases showed a small amount of blood and a ruptured corpus hemorrhagicum about 1 or 2 cm. in diameter. Of this latter group, 39 were still oozing blood at the time of operation. All the cases of ruptured corpus hemorrhagicum were treated by mattress suture.

3. There were 18 cases of corpus hemorrhagicum cyst, of which 13 had ruptured. Resection was done in all the cases of this group, and the pathological diagnosis was corpus-hemorrhagicum cyst or corpus-luteum cyst with hemorrhage.

Since no cases with obvious signs of intra-abdominal hemorrhage (so well described by other authors) have been included, the cases in all 3 categories presented similar general symptomatology, differing only in minor details.

The time of onset of the pain in relation to the last menstrual period was determined in 162 cases. It started between the eighth and the twenty-first day after the beginning of the last period. In 113 or 70 per cent, of the cases the pain occurred between the twelfth and the sixteenth day after the onset of the last menses. The patients with ruptured graafian follicles invariably had symptoms at the middle or in the early part of the intermenstrual interval. Many of the cases of ruptured corpus hemorrhagicum started at the middle of the cycle, but the majority occurred in the latter part. All of the patients with corpus-hemorrhagicum cysts had symptoms about twenty-one days after the first day of the last period.

The pain was sharp and knifelike, at times radiating to the umbilicus, but more often diffuse across the whole lower abdomen. In 12 cases there was pain in the back, and in 5 the pain radiated to the right knee. In the latter group more blood was usually found in the pelvis than is ordinarily en-

countered. The pain was distinctly intermittent, except in the cases with cysts, and tended after its acute onset to localize in the right lower quadrant of the abdomen even when the left ovary was involved.

Since the majority of these cases are confused with appendicitis, it is interesting to see how many patients had had a previous appendectomy. In the entire series of 257 cases, only 6 patients had had their appendices removed. One of these 6, with pain on the left side, and 2, with pain on the right side, were believed to have a ruptured corpus hemorrhagicum, and were discharged without operation. The other 3 were operated on, the condition in 1 patient with left-sided pain being diagnosed as an ovarian cyst, and in the 2 others with pain on the right side, as adhesions and ectopic pregnancy, respectively.

There was tenderness on deep pressure throughout the whole lower abdomen, particularly in the right lower quadrant, even if the lesion was on the left. Tenderness below McBurney's point was of considerable aid in the differential diagnosis. Muscle spasm and rebound tenderness were conspicuous by their absence. J. THORNWELL WITHERSPOON, M.D.

McNamara, W. L., Smith, H. D., and Boswell, C. S.: Retroperitoneal Fibrosarcoma. A Report of 8 Cases. *Am. J. Cancer*, 1940, 38: 63.

Connective-tissue tumors are unusual in the retroperitoneal space. The finding of 8 such neoplasms during 2,500 routine autopsies forms the basis of this report. These tumors were symptomless until they had reached inoperable proportions and caused damage to vital structures. They were not accompanied by the degree of systemic toxicity or cachexia usually associated with malignant tumors of a corresponding size. They showed little tendency to metastasize and were radioresistant.

Surgical extirpation is the rational treatment in cases in which the tumor is diagnosed before its size and relation to the neighboring organs render operation impossible.

The prognosis is unfavorable because these tumors are seldom recognized until they are inoperable.

JOSEPH K. NARAT, M.D.

GYNECOLOGY

UTERUS

Bracale, U.: A Histological and Clinical Study of Spontaneous Rupture of the Uterus (Contributo istopatologico e clinico allo studio delle rotture spontanee dell'utero). *Arch. di ostet. e ginec.*, 1939, 3: 544.

The author points out that numerous authors have studied the symptoms and pathogenesis of spontaneous rupture of the uterus since 1620, when the condition was first described by Guillemeau. The principal cause of uterine rupture is usually interference with normal labor, either on the part of the mother (small pelvis, tumors in the pelvis, tumors of the internal genitalia, or stenosis or atresia of the genital canal), or on the part of the fetus (abnormal presentations, hydrocephalus, or monstrosities). Other causes, both congenital and acquired, diminish the resistance and distensive capacity of the uterus, and include such conditions as scar formation, degenerative processes, inflammations, vicious insertion of the placenta, and malacia of the myometrium; all these conditions endanger the life of the parturient and offer little opportunity for prophylaxis.

The author reports 2 clinical cases in detail. The first was that of a thirty-year-old multipara who had had three previous pregnancies with normal delivery and puerperium. The present pregnancy terminated in spontaneous labor with breech delivery of a dead infant. After delivery of the placenta a lesion was noted in the lower uterine segment. Laparotomy was done immediately and an L-shaped laceration 5 cm. long was found in the anterior uterine segment extending to the left round ligament. The uterus and adnexa were removed and the patient recovered. Histological study of the uterus at the site of the tear revealed fatty and hyaline degeneration of the muscle fibers, edema of the connective tissue, inflammatory foci, and vascular lesions, particularly of the media and intima of the blood vessels.

The second case was that of a thirty-three-year-old para-iv who had a history of three normal pregnancies and one cesarean section for placenta previa. The present pregnancy ran a normal course until the onset of labor. After about twenty-four hours of labor the pains ceased. On admission the patient was in a serious condition; she was pale and dyspneic and had a small pulse (140). On physical examination the diagnosis was complete rupture of the uterus at the level of the lower uterine segment with passage of the fetus into the abdominal cavity. The fetal heart tones could not be heard. At laparotomy the fetus was removed from the abdominal cavity. An S-shaped tear was found in the right side of the inferior uterine segment, and a subtotal hysterectomy was performed. The patient recovered. Histological study of the tear revealed the old scar of the previous cesarean operation, which had not healed properly; the muscle tissue was atrophic, there were inflammatory foci in the myometrium, and the scar was poorly supplied with blood vessels.

The author presents the experiences of various investigators as recorded in the literature, and emphasizes particularly the significance of previous cesarean operations in relation to this complication of pregnancy. JACOB E. KLEIN, M.D.

De Freitas Amorim, M.: The Capsule of a Uterine Myoma (Contribuição para o estudo da chamada capsula dos miomas uterinos). *Rev. de obst. e ginec. de S. Paulo*, 1939, 4: 1.

In contrast to the prevailing opinion, uterine myomas cannot be considered as encapsulated blastomas as they are never completely isolated from the myometrium. The myomatous nodules are connected with the myometrium by bands of connective tissue or smooth muscle fibers. The pedunicles, if any, may also be of a fibrous vasculomuscular or parenchymatous character. The author concludes that the term "dysplasic status" should be replaced by "blastomatous status" with reference to uterine myomas. JOSEPH K. NARAT, M.D.

Gemmell, A. A., and Jeffcoate, T. N. A.: Estrogens and Carcinoma of the Uterus. *J. Obst. & Gynaec. Brit. Emp.*, 1939, 46: 985.

During the three years ending December 31, 1938, the authors treated 43 cases of senile vaginitis and kraurosis vulvæ with estrogenic hormones and local applications of 3 per cent mercurochrome. Three of their patients developed cancer of the cervix. (There are no photomicrographs in this article.)

In the first case, the woman, who was forty-five years old, had had a subtotal hysterectomy and removal of the adnexa in 1934. She presented herself in April, 1937, because of a yellow vaginal discharge, which had been present for three weeks, and because of a slight hemorrhage one week previously. Senile vaginitis was found; the cervix was slightly lacerated but it appeared healthy. During the next six weeks she received daily paintings of the vagina with mercurochrome and a total of 30 mgm. of estradiol benzoate intramuscularly, together with 8 mgm. of oral estrone. Treatment was stopped. In September she reported that the discharge had recurred two weeks previously and that there had been one small hemorrhage. A recurrence of the vaginitis was found but the cervix appeared healthy. Similar treatment was started, and continued for four weeks. However, the discharge persisted and on October 5 it was found that the cervix was friable; a biopsy revealed squamous-cell carcinoma of the cervix.

In the second case, the woman, who was fifty-three years old, had passed the menopause six and one-half years before she reported on August 24, 1938, be-

cause of a yellowish vaginal discharge, which had been present for a few months; at times the discharge had been streaked with blood. A senile vaginitis was found; the cervix was lacerated but seemed to be healthy. Treatment was not started until September 17. The vagina was painted three times weekly with mercurochrome. She was given estradiol benzoate, 1 mgm., intramuscularly three times a week. Two weeks later she had some uterine hemorrhage. On October 12 treatment was stopped because the vaginitis was healed and there was no discharge. On January 10, 1939, she reported that there had been slight hemorrhage; however, there was no vaginitis. Curettage was advised but the patient demurred. She again reported on March 11, 1939, stating that she had been bleeding off and on during the intervening two months. A suspicious friable area on the posterior lip of the cervix was excised; this was reported to be squamous-cell carcinoma.

The third case, a woman forty-five years old, was admitted to the hospital on September 4, 1937, because of smarting and irritation of the vulva during the previous two years. During these two years the menses had been irregular, lasting from two to seven days, and occurring about every two weeks. For five weeks she had had a yellowish blood-stained discharge. A senile vaginitis was found; there was slight vaginal prolapse and the cervix was healthy. A diagnostic curettage was performed but no evidence of malignant disease was found. This was followed by daily painting of the vagina with 3 per cent mercurochrome. She was also given estrogenic hormone, 5.5 mgm. of estradiol benzoate and 4.4 mgm. of estrone. Five weeks later, that is, on October 9, 1937, the vaginitis was healed; the discharge and pruritus had disappeared. She next reported a year later, on November 2, 1938, because of continuous bleeding for thirteen weeks. A carcinoma of the cervix in Stage II was found; tissue from the cervix was reported as squamous-cell carcinoma.

"Each of the cases individually does not provide any definite evidence that the onset of carcinoma was related to the oestrogenic hormonic therapy. . . . simultaneous administration of progesterone prevents or reduces the metaplasia in the cervix which results from oestrogens. If this be true it may be advisable to give corpus-luteum hormone as well as oestrogens in the treatment of such conditions as senile vaginitis." GEORGE H. GARDNER, M.D.

Dresser, R., Meigs, J. V., and Rude, J. C.: The Combined Roentgen and Radium Treatment of Carcinoma of the Cervix. *Am. J. Roentgenol.*, 1940, 43: 17.

Seventy cases of carcinoma of the cervix treated by combined roentgen-ray and radium therapy, previously reported both with regard to the technique used and the results obtained, are reviewed in detail. This series is compared with 150 cases treated by radium alone and 60 cases operated on without irradiation. The results after three and one-half years showed that there was a 35 per cent salvage by combined roentgen and radium treatment, which was 10 per cent better than that obtained by radium alone and nearly equal to that from a small selected group subjected to hysterectomy. The results in relation to the stage of the disease are also tabulated. The rationale of the improved results of the combined roentgen and radium treatments over radium alone is discussed briefly. A subsequent check-up of the previously reported group revealed only a 2 per cent difference between the five-year survivals and the three and one-half-years' salvage. This would indicate that most of the patients who die after irradiation of cancer of the cervix do so within the first three and one-half years, and that for statistical purposes it is not essential to wait for five-year results.

Within the last few years 59 cases of carcinoma of the cervix have been treated with 1,000,000-volt roentgen therapy combined with radium applications. This method has not been in use sufficiently long for the accumulation of statistical data but certain differences have become apparent. These are discussed at some length under skin reactions, effects on the general condition of the patient, reaction of the deep-lying normal structures, and effects on the tumor. The results obtained in 31 of the 59 cases subjected to supervoltage therapy which had had no previous irradiation are tabulated and also discussed in detail. They compare favorably with those obtained by previous methods.

In the discussion, the authors state that there are several immediate advantages to be ascribed to the higher voltage therapy. When multiple small portals are employed, the total depth dose which can be delivered at 200 kv. is limited by the reaction of the skin rather than by any untoward effect on the deeper structures. The reverse is true with 1,000,000-volt therapy. The physiological depth dose obtained from the shorter wave lengths is greater than that measured by the thimble ionization chamber, and symptoms of rectal and bladder irritation, which were lacking in the 200-kv. group, have developed in the 1,000-kv. group. The patients have tolerated the supervoltage treatment rather better than the 200-kv. radiation as far as roentgen sickness is concerned.

It is the authors' belief that the dosage thus far administered to the center of the pelvis by external roentgen irradiation alone is not sufficiently large to permanently control epidermoid carcinoma. They think that larger amounts of supervoltage radiation than have thus far been administered will eventually be given with safety. Radium is most likely to fail when parametrial extension of carcinoma of the cervix has occurred. In such cases, it might be well to place chief reliance on heavy external irradiation, augmented by a small radium dose. On the other hand, in those cases in which the disease is limited to the cervix, or has extended slightly beyond the cervix, a modification of technique consisting of a

relatively large dose of radium and less roentgen therapy seems logical. ADOLPH HARTUNG, M.D.

Walker, J. Z.: A New Technique of Treatment of Carcinoma of the Cervix Uteri by Combining X-Rays and Radium. *Brit. J. Radiol.*, 1940, 13: 1.

As is well known, carcinoma of the cervix uteri usually spreads by direct extension to the paracervical tissues and by lymphatic drainage to the regional lymph nodes and the broad ligaments. It is important to bear in mind that the spread to all these parts may start in the earliest stages of the disease, and therefore the success of radiation therapy will largely depend on whether or not the entire tumor-bearing volume of tissue was adequately subjected to a lethal dose of radiation. Since radium alone, when applied intracavitarily, fails to reach in sufficient intensity the lateral portions of the pelvis unless the vagina and uterus are grossly overdosed, it appears best to make up this deficiency in dosage of the more distant parts by the addition of x-ray treatment.

Having the importance of uniformity of dosage in view, the author in this article attempts to evolve a technique which would permit the administration of a satisfactory minimum tumor dose throughout and, at the same time, keep the maximum tissue dose as low as possible. Because of many obvious advantages, the roentgen has been adopted also as the unit of radium dosage, it being assumed that 7.6 roentgen hours is the radiation measured at 1 cm. distance from a point source of 1 mgm. of radium filtered by 1 mm. of platinum. The carcinoma lethal dose at any given point was taken as 10,000 roentgens for the radium and 5,000 roentgens for the x-rays of 2.5 mm. copper half value layer and .09 Ångström's unit average wave length if the irradiation is extended over a period of one month.

In devising the radium technique, the author makes use of five standard methods of application which are described and diagrammatically illustrated in the text. In addition, for each standard method isodose charts of the individual radium tubes, as well as composite graphs of the complete radium treatment are given, by which means the dosage levels within the whole of the pelvis are expressed. It is evident from these graphs that the maximum radium dose is in the center of the pelvis at the source of application and that from here there is a gradual fall toward the periphery. This fall is expressed in percentage deficiency in relation to the lethal carcinoma dose. Thus, 3,500 roentgens of radium at a certain point would, for example, represent a 65 per cent deficiency (in relation to the 10,000 roentgen lethal radium dose).

The x-ray technique is, then, so planned as to make up this deficiency. Since centrally the radium is already 100 per cent effective, a thick lead screen is placed vertically across the middle of the anterior and posterior fields, the width of the screen varying from 4 to 6 cm., according to which standard method is employed. The lateral fields, on the other hand, are directed medially at an angle which is varied according to the thickness of the patient's pelvis and so arranged as to conform to the type of radium applicator chosen. As already mentioned, the magnitude of the x-ray lethal dose for the stated factors is taken as 5,000 roentgens so that a 65 per cent deficiency at a given point, for example, will be brought up to a 100 per cent effectiveness by the administration of a dose of 3,250 roentgens over that point in a period of one month. X-ray isodose charts as well as tables expressing in detail the radium percentage deficiency and the complementary x-ray dosage for all five standard methods are included.

The technical procedure is as follows:

The patient is examined and the type of standard applicator which may be most suitably employed is chosen. The complementary x-ray course for this applicator is then started, all fields being treated every day—five days per week. After the first half of the x-ray series (twelve days), half of the total radium dosage is given (two days). As soon as the radium is removed, the second half of the x-ray series is administered (twelve days) and, finally, the remaining half of the radium dosage is applied (two days). Thus the total duration of the treatment is one month. If satisfactory positioning of the radium applicator is not practicable at the appropriate time, or if the case is septic, the complete course of x-ray irradiation may be carried out first, and the radium given in two stages at the end of the fourth and the sixth week. Other slight deviations from the general rule may appear necessary from time to time.

The conclusion is reached that this combined method of radium and x-ray radiation constitutes a notable advance in the treatment of cancer of the cervix uteri. It is probable that the failures of radium application alone are the result of gross underdosage of the more distant parts of the pelvis rather than of any inherent insensitivity of the carcinoma cells.

T. LEUCUTIA, M.D.

Kirchhoff, H.: Fractional Irradiation of Advanced Cervical Carcinoma with Attention to Complications in the Urinary Tract. Acute Complications and Primary Cures (Die fraktionierte Roentgenbestrahlung fortgeschrittener Collumcarcinome bei Mitbeteiligung der abfuehrenden Harnwege. Akute Gefahren und primaere Heilungen). *Strahlentherapie*, 1939, 65: 579.

In regard to the danger of acute uremia following intensive irradiation of advanced cervical carcinoma, in which cases involvement of the urinary tract usually occurs, the author states, on the basis of his observations, that a thoroughly exhaustive investigation of the urinary system by means of cystoscopy, determination of the residual urine and, above all, by x-ray investigation of the urinary tract must be made. If these tests show a bilateral involvement of the urinary tract, extreme caution is necessary in the use of irradiation so as to avoid a closing of the already narrowed ureter by the irradiation, with its

ultimate resulting uremia. In these cases irradiation of one side of the body is recommended in order that the other side may remain functional. In unilateral involvement the situation is more favorable, although even in these cases there is danger of uremia when a reflex anuria occurs in the uninjured side of the tract and the situation must be met with immediate ureteral catheterization. The success of the irradiation therapy is dependent upon the use of high doses in the simple fractional, modified Coutard method. The individual skin dose should amount up to about 4,000 roentgens, and the centered dose to from 3,000 to 5,000 roentgens.

(SCHMITZ). RONALD R. GREENE, M.D.

ADNEXAL AND PERIUTERINE CONDITIONS

Dunet, C., and Dargent, M.: Typhoid and Paratyphoid Suppurative Processes in Ovarian Cysts (Les suppurations typhiques et paratyphiques des kystes de l'ovaire). *Lyon chir.*, 1939–1940, 36: 513.

There have been 41 reports in the world literature of infections in ovarian cysts caused by typhoid bacilli; only 2 of the patients died. The management is, above all, surgical, and the authors believe that, if possible, the whole infected organ should be removed; if this is not feasible, then marsupialization with free drainage is the treatment of choice.

The diagnosis usually follows typhoid fever, but the symptoms and signs are similar to those of any pelvic abscess under pressure. The size of the cysts varies from that of a hen's egg to a size which reaches the costal margin; the cysts increase in size slowly as the infection progresses. Sometimes the original typhoid infection had occurred so long before the pelvic manifestations were noticed that it had been forgotten or not thought to be any longer significant.

The authors present the intriguing hypothesis that the embryological origin of the ovary from the hindgut somewhat predisposes this organ to typhoid infection, and further note that dermoid cysts, with their components of differentiated intestinal cells, are the most often infected by typhoid bacilli. No case has been reported in which more than one ovary was affected, despite the presence of bilateral cystic changes. E. S. BURGE, M.D.

Haffner, J.: The Results of Conservative and Operative Treatment of Salpingitis (Ergebnisse der konservativen und der operativen Eileiterbehandlung). *Nord. Med.*, 1939, p. 2255.

The material embraces 422 cases of non-tuberculous salpingitis observed during the years from 1929 to 1936; 284 of which were treated conservatively exclusively and 138 (30 per cent) of which were treated by operation. It was possible to obtain information from 258 patients principally by questionnaires, which was done in order to consider the functional result rather than the anatomical. Thirty-three and four-tenths per cent of the cases were of gonorrheal origin, to which part of the 48.2 per cent of unknown origin must surely be added. Eighteen and four-tenths per cent were septic and developed primarily after an abortion; only a few developed after a birth. Approximately half of the patients were married and a third had had children previously. More than a third of the patients had had recurrences and each attack had caused an inability to work for an average duration of three months. Conservative therapy consisted of bed rest and, when the acute symptoms had subsided, of local heat given by means of incandescent light cradles, diathermy, or short-wave therapy.

Good results with full ability to work were obtained in 62 per cent. Thirteen and six-tenths per cent of the patients had had such bothersome symptoms that they had sought out the doctor and some had been unable to work. Twenty-two per cent have had recurrences that caused their admission to the hospital or that made them bedridden at home for several weeks. Forty-six (42.2 per cent) were known to be pregnant and 38 of these carried through the pregnancy. Of 75 who had had children previously, only 15 bore additional children and 6 aborted, while of 33 who married after the treatment, 23 (more than two thirds) became pregnant. This shows that some of the first pregnancies were not desired and that the estimated frequency of pregnancy is a minimum figure. In 1 of 169 patients an extra-uterine pregnancy occurred. One of the 46 patients that gave birth after treatment died of puerperal sepsis.

Approximately half of the 138 patients operated upon were previously treated conservatively one or more times. The advantages of the operative treatment are shortening of the duration of the illness and the prevention of the probable recurrences; the disadvantages are the immediate risk of operation, loss of the ability to become pregnant, and eventual prolapse.

The size of the adnexal tumors was not as decisive an indication for operation as the consideration of the patients' ability to work. The operation was conservative and consisted in the removal of one or both tubes, as a rule, with removal of one and resection of the other ovary; only in 2 cases was a radical operation with removal of the uterus and both adnexa carried out. In 64.4 per cent of the patients there have been good results, 16.7 per cent have had bothersome symptoms, and 15.5 per cent have recognized recurrences and half of these have been operated upon again. A good result was obtained in three-fourths of the cases by bilateral removal of the tubes. Since only 2 of the unilaterally operated patients became pregnant, the use of this less certain method is not justified. There were 2 postoperative deaths among the 138 patients, both of whom were operated upon in the acute stage of the condition. Infection in the abdominal wound was seen in 22 cases, 13 of which were drained; in the last year drainage was omitted. Symptoms of prolapse occurred only in 5 cases and in slight degree.

The author draws from his investigation the conclusion that when the ability to become pregnant is not important it will be proper to consider operation after the acute symptoms of the first attack have subsided, in order that with small operative risk a chronic illness which prevents the patient from earning her living may be shortened and recurrence prevented.

(Axel Olsen). John R. Paine, M.D.

MISCELLANEOUS

Abarbanel, A. R.: Rationale for the Use of Testosterone Propionate in the Immediate Treatment of Excessive Uterine Bleeding. *Am. J. Obst. & Gynec.*, 1940, 39: 243.

All of the sexual hormones possess bisexual properties to varying degrees. Testosterone, in particular, is not only a powerful androgen, but also a very potent gynecogen. As regards the female, the effects exerted by testosterone are dual, for it may behave as an estrogen or a progestogen. A physiodynamic explanation is offered of the modus operandi by which excessive uterine bleeding is controlled by testosterone propionate. This interpretation is based, in the main, upon the response of the myometrial elements to testosterone propionate.

Adequate contraction of the myometrium will bring about a functional constriction of the vessels, especially the proximal (myometrial) portion of the spiral arterioles.

The response of the myometrial elements to testosterone propionate is twofold. First, this hormone will inhibit rhythmic, intermittent uterine contractions and thereby eliminate the pumping action of these movements. As a result, the volume of blood flowing to and, thus, through the uterus will definitely decrease, for the degree of activity of muscle and its blood supply are directly proportional. Second, the direct stimulative, squeezing effect of testosterone upon the myometrial elements will bring about a functional constriction of the myometrial vessels. The sum total of the twofold effects of testosterone propionate (inhibition of intermittent uterine contractions and direct stimulative action upon the myometrial elements) acting simultaneously upon the myometrial elements will result in a decided reduction in the flow of blood to the endometrium. Consequently, the amount of uterine bleeding will be very considerably diminished. Upon these considerations, the use of testosterone propionate for the immediate treatment of excessive uterine bleeding finds it rationale.

Edward L. Cornell, M.D.

OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

Sturgis, S. H.: The Diagnostic Significance of the Endometrial Glands in Early Pregnancy. *Am. J. Obst. & Gynec.*, 1940, 39: 10.

In this article attention is called to the importance of recognition of a characteristic pattern of increased glandular activity in the endometrium. This picture was found consistently and early in the cases reported.

In this series of 1,500 biopsies, taken for a variety of gynecological conditions, all phases of both normal and abnormal menstrual cycles were observed. Eleven of the biopsies in this series, however, showed a certain similar and distinctly unusual pattern of secretion in the endometrial glands, and in 10 of these 11 cases an early pregnancy was confirmed by subsequent events.

The tissue removed averaged not more than 5 c.mm. Not infrequently such small pieces may be removed in early pregnancy without the surgeon's finding either decidual tissue or villi on microscopic study. There was an adequate number of glands in the spongy layer showing unusual secretion to suggest a diagnosis of pregnancy. Under low power, these glands were saw-toothed when cut longitudinally and star-shaped with many invaginations when cut across. In the spongy layer they lay crowded close together in early gestation and their general configuration was similar to that seen during the active luteal phase of the menstrual cycle. The lumina sometimes contain cellular débris but not usually enough to cause distention of the gland walls which, more often, lay in contact. The epithelial cells lining the glands were swollen, and larger and of a higher columnar type than those found at any time in the normal menstrual cycle. This forced them to bulge into the lumen like an exaggerated goblet cell. They were filled with coarse, deep-staining granules, except at the luminal margin where these granules were absent and a fine reticular network could be made out. Their free edge, ballooning out into the lumen, usually showed a clear-cut, sharp, and distinct cell membrane. The nuclei were round, light-staining, and near the basement membrane. There were no epithelial mitoses. Decidua vera was encountered in only 5 slides and chorionic villi were found only once.

EDWARD L. CORNELL, M.D.

Traverso, L. G.: Blood-Pressure Studies and the Mechanics of the Circulation in Pregnancy and the Puerperium (Studii sfigmomanometrici e di meccanica circolatoria in gravidanza ed in puerperio). *Folia demograph. gynaec.*, 1939, 36: 677.

The author first reviews some of the pertinent literature on blood pressure and the mechanics of the circulation in pregnancy and the puerperium. He notes that the mass of circulating blood averages 4,000 c.cm. in the normal woman, 5,100 c.cm. in the pregnant woman at four months, 5,600 c.cm. in the pregnant woman at term, and 4,200 c.cm. from the eighth to the tenth day post partum. The mass of blood increases daily by 8.5 c.cm. from the beginning of pregnancy to the fourth month, after which time it slows down to an increase of 3.5 c.cm. Likewise, the volumetric capacity of the cardiovascular apparatus increases by 27.5 per cent during the first four months of pregnancy, and by 12.5 per cent during the second half of pregnancy, and decreases by 40 per cent during the brief puerperium.

The author studied in detail the blood-pressure reactions of 606 women; this number included both normal women and women in various stages of pregnancy. He then made comparative studies of the blood volume and the blood pressure, and gave the A:V ratio, which he says is the arterial pressure expressed in millimeters of mercury over the total volume of the circulating blood as expressed in cubic centimeters. For the normal woman the A:V equals 0.80; for the pregnant woman up to the fourth month it is 0.79; for the pregnant woman at term it is 0.68; and on the eighth day of the puerperium it is 0.63. Numerous graphs and tables illustrate the findings.

The article contains an instructive tabulation of the circulatory changes in the period of pregnancy and in the puerperium which is useful for purposes of comparison. Thus in pregnancy there is a daily increase in the mass of circulating blood and in the cardiovascular capacity. This increase is rapid during the first four months (27.5 per cent of normal) and gradually slows down to an increase of 12.5 per cent of normal. During the puerperium, however, there is a daily and progressive diminution of the circulating blood mass and cardiovascular capacity; by the tenth day of the puerperium this diminution amounts to 40 per cent of the normal mass of blood. Pregnancy is characterized by a daily and progressive new formation of uterine vessels and terminal capillaries, a daily and progressive increase in the capillary bed and in the permeability of the capillaries themselves, and a progressive increase in the pressure and contents of the venous system, in the diastolic volume of the heart, and in the pulse pressure. The puerperium, on the other hand, is characterized by a gradual daily diminution in the uterine vascular network, a daily diminution in the extent of the capillary bed and in the permeability of the capillaries, and a diminution in the pressure and contents of the venous system, in the diastolic volume of the heart, and in the pulse pressure. In the middle of pregnancy the chief characteristic is the predominance of the uterine circulation over the cardiac pole of the circulatory system, while in the puerperium the reverse is true. Finally, during pregnancy there is evidence of myocardial insufficiency and a relative valvular insufficiency, while in the

puerperium myocardial insufficiency is more marked than a relative valvular insufficiency.

In his conclusions the author points out that the three most typical phenomena of pregnancy are: (1) the progressive development of the vascular network of the gravid uterus; (2) the progressive increase in the volume of the circulating blood, especially during the first four months of pregnancy; and (3) the progressive increase in the permeability of the terminal uterine capillaries. The latter condition leads to the transfer of most of the blood volume from the arterial to the venous side of the circulation during pregnancy. The heart as a consequence enters into a state of hyperfunction to establish equilibrium between the masses of arterial and venous blood.

During the puerperium there are three essential phenomena: (1) progressive involution of the uterine vascular structures; (2) progressive diminution of the mass of the circulating blood; and (3) progressive diminution in the permeability of the uterine capillaries, through obliteration, for example. The heart gradually returns from a state of hyperfunction to a normal condition. Studies of the A:V ratio confirm these concepts of the circulatory mechanics during pregnancy and the puerperium.

JACOB E. KLEIN, M.D.

Schjött-Rivers, E.: Hyperemesis Gravidarum. *Acta obst. et gynec. Scand.*, 1939, 19: 290.

The author opens his discussion of the vomiting of pregnancy by stressing our lack of knowledge concerning the genesis of the extensive and often deeply penetrating changes that take place throughout the organism under these conditions. In a series of 3,000 patients, psychic factors loomed large and were difficult to evaluate. Moderate vomiting occurred in 24.4 per cent of the patients, 6.7 per cent had protracted vomiting, and 1.5 per cent required hospitalization. There were 3 times as many primiparas as multiparas in the latter 2 groups.

A decrease in the blood chloride was the most prominent finding, though the serum chloride values may be normal in obstinate cases of vomiting, hence the toxic symptoms are probably not due to the hypochloremia. The non-protein nitrogen content of the blood was not increased in the absence of kidney lesions, and was not found significant either in treatment or prognosis. Hyperurobilinuria was present in 80 per cent of the severe cases, but is thought of as an expression of carbohydrate deficiency, and is of small value in determining toxic effects.

Hyperbilirubinuria was found to be a better manifestation of incipient liver damage than the result of any other liver function test.

Kidney lesions were rare, and were present only late in the course of pregnancy. Eight of the 9 fatal cases showed albuminuria. The systolic blood pressure averaged 117 mm. of mercury. Fever in the presence of fairly adequate hydration meant severe intoxication, and was an indication for the interruption of pregnancy. Nervous changes were found only late in the disease. There was a 35 per cent mortality in this group.

Post-mortem findings were chiefly changes in the liver, which were similar in many ways to those of acute yellow atrophy; hence, different from those of eclampsia.

E. S. BURGE, M.D.

Carter, B., Jones, C. P., Ross, R. A., and Thomas, W. L.: Vulvovaginal Mycoses in Pregnancy. *Am. J. Obst. & Gynec.*, 1940, 39: 213.

Cultures of yeastlike fungi from the vaginas and vulvas of 200 pregnant women were positive in 86 (or 43 per cent). These fungi belonged to the genera monilia, saccharomyces, or cryptococcus. Sixty-six (33 per cent) of the patients showed positive vaginal cultures; 20 (10 per cent) showed positive labial cultures with negative vaginal cultures.

A total of 151 strains of yeastlike fungi were classified according to the method previously described by Jones and Martin. Each strain identified as monilia albicans was pathogenic for rabbits, while each strain identified as monilia stellatoidea was nonpathogenic for rabbits.

In patients in whom the fungi were identified as belonging to the genera saccharomyces or cryptococcus, no symptoms referable to a mycotic infection were described. Symptoms in patients with positive cultures for yeastlike fungi, belonging to the genus monilia, were found only in those in whom the 3 species albicans, stellatoidea, and (candida) tropicalis were isolated. Although the incidence of trichomonas was higher in the patients from whom monilia stellatoidea was cultured, more patients complained of pruritus in the group from which monilia albicans was cultured.

Intradermal skin tests with antigens from the 5 species of monilia showed no correlation between positive cultures and positive intradermal tests. The incidence of monilia was higher in the group with negative skin tests. The presence or absence of agglutinins in the patient's serum could not be used as an index of vaginal or labial infection with monilia. Vaginal smear typing showed that monilia were found more frequently in patients with vaginal bacilli, and trichomonas more frequently in patients without vaginal bacilli.

Additional work must be done on the mycological flora of the vulva and vagina in normal patients and in patients with mycotic vulvovaginitis, before one may understand the relative pathogenicity of the different genera and species of yeastlike fungi, and evaluate methods of diagnosis and treatment.

EDWARD L. CORNELL, M.D.

Brown, W. H., and Dippel, A. L.: The Uses and Limitations of Soft-Tissue Roentgenography in Placenta Previa and in Certain Other Obstetrical Conditions. *Bull. Johns Hopkins Hosp.*, Balt., 1940, 66: 90.

The site of implantation of the placenta can be localized accurately by soft-tissue roentgenography in a large percentage of cases. The authors were

Fig. 1.

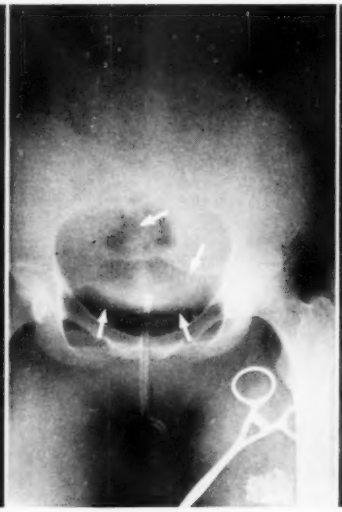

Fig. 2.

Fig. 3.

Fig. 1. Placenta well up in fundus posteriorly. Upper arrows indicate uterine silhouette. Lower arrows indicate nearest fetal soft parts, placenta causes localized thickening at this point.

Fig. 2. Typical appearance of placenta previa with air-filled bladder. Upper arrows on fetal skull. Lower arrows indicate dome of bladder. Placenta produces marked thickening of intervening soft parts.

Fig. 3. Placenta previa with placenta on posterior wall. Note marked separation of fetus and maternal spine.

able to do this in more than 85 per cent of more than 200 cases examined. The accuracy of the localization may be improved in some cases by making additional roentgenograms after the bladder has been distended with air. The use of these methods of localization is a very valuable aid to the obstetrician in cases of suspected placenta previa and other obstetrical conditions, such as premature separation of the normally implanted placenta, suspected fetal anomalies, abnormal presentations, fetal death *in utero*, and even multiple pregnancy and hydramnios.

CHARLES BARON, M.D.

LABOR AND ITS COMPLICATIONS

Procter, I. M., and Dickinson, K.: A Study of the Occipitoposterior Positions of the Vertex: Analysis, Management, and Results in 106 Consecutive Cases. *J. Am. M. Ass.*, 1940, 114: 381.

Occipitoposterior positions are caused by the presence of abnormally directed forces during labor. This in turn is most often caused by some pelvic disproportion—usually of the simple flat variety.

In treatment there are three cardinal principles: awaiting dilatation, awaiting engagement, and awaiting rotation. Dilatation and engagement are fundamental in delivery from below, but rotation, if not spontaneous in a reasonable time, should be accomplished manually for the welfare of both the mother and baby.

From statistics on 106 cases of occipitoposterior positions the following facts seem most evident:

1. Parity and age are not factors in this complication.
2. A previous history of difficult labor is frequent but not decisive, since the size of the fetus is variable.
3. Most of the patients in whom pelvic measurements were possible presented evidence of moderate shortening of the true conjugate. This was true also for the intertuberous measurement.
4. Long labor and increased loss of blood are frequent, although when the baby is small the reverse may be true.
5. The ill fit of the fetal head at the pelvic brim often leads to premature rupture of the membranes.
6. Maternal morbidity was somewhat higher in this group.
7. The fetal mortality was 2.7 per cent.
8. The maternal mortality was 0.

J. THORNWELL WITHERSPOON, M.D.

Bittmann, O.: Cesarean Section, with Especial Reference to Cesarean Section according to the Method of Doerfler (Zur Klinik unserer Kaiserschnitte. Mit besonderer Berueksichtigung des Kaiserschnittes nach Doerfler). *Arch. f. Gynaek.*, 1939, 169: 121.

The author discusses the cesarean sections performed at his clinic in Olmuetz from 1933 to 1939.

Of a total of 4,973 deliveries in this period, 191 (3.8 per cent) were performed by section. The indications were contracted pelvis (120), eclampsia (14), placenta previa (13), elderly primiparas (35), pathological presentations (6), and disease in the mother (2). In 81 cases with contracted pelvis the amnion was ruptured; in 23 for more than twenty hours. Thirty-nine of the sections were performed by the transperitoneal cervicocorporal method and 152 by the Doerfler method. The yearly number of cesarean sections rose from 0.5 per cent for 1933 and 1934 to 6.4 per cent for 1938 and 1939. The total unexpurgated mortality of the author's operations amounted to 3 (1.57 per cent); but of these 2 were not to be charged to the operation itself. The operations by the Doerfler method resulted in not 1 fatality.

As disadvantages of the stretching of the uterus are suggested: longer duration of operation, the possibility of superficial injuries to the uterine serosa with later deformities, shock of the patient, and possible bleeding from tears in the peritoneum of the pouch of Douglas. On the basis of his experiences in delivering the gravid uterus forward, the author believes that the danger of infection of the peritoneal cavity from septic uterine contents during the operation is not so great as has been generally accepted. Infection of the peritoneum from the uterus is primarily dangerous on the third and fourth days along the stitch holes and from dehiscence of the uterine sutures.

The great advantage of the transverse cervical section by the Doerfler method lies in the fact that the operative field is situated in the true pelvis and after peritonealization it is hermetically sealed from the peritoneal cavity.

The author's modification of the Doerfler method is described in detail. By means of two retention sutures of catgut in the angles of the transverse cervical wound, it is possible to deliver the uterine incision outside of the skin incision.

The first suture is an interrupted musculomuscular suture; above the first comes the second musculomuscular suture according to Lembert, and this runs from one angle suture laterally to the other. The third suture is a continuous one from the upper cut edge of the cervical peritoneum to the cervical musculature below the second suture. The fourth suture, which is continuous, unites the bladder peritoneum with the seromuscular cervical layer above the third suture. Both peritoneal sutures are laid about 0.5 cm. above and below the level of the second uterine suture. Smooth healing of the muscle cicatrix was observed at repeated cesarean deliveries.

In all the repetitions (13 cases with 1 and 4 cases with 3) the scar was not visible macroscopically; also, no deformities were found. In contrast to this there were often severe deformities present in repetitions of cases previously operated on by the cervicocorporal method (7 cases with 1 and 1 case with 3). Also the comparison of the morbidity figures gives a favorable proportion for Doerfler's method, 15.1 per cent as against 46.1 per cent for the cervicocorporal method. All cesarean sections were performed under lumbar anesthesia. The advantage lies especially in the insignificant blood loss. Late hemorrhages did not occur.

In conclusion the author states that the Doerfler section holds first place among all methods of cesarean section as it leads to the best results both in the mother and the child.

(Seynsche). Richard Warren, M.D.

URINARY ANTISEPTICS

Collective Review

HARRY CULVER, M.D., F.A.C.S., and WILLIAM F. SEIFERT, M.D., Chicago, Illinois

THE administration of chemical substances orally and intravenously in the effort to sterilize an infected urinary tract is a procedure used for many generations with indifferent success. Never until recent years, however, has there been a drug or combination of drugs which would produce a sterile urine in a majority of cases.

The ideal excretory urinary antiseptic should be easily given by mouth, but capable of parenteral administration if necessary. It should be well tolerated by the intestinal tract, and have no immediate or delayed systemic toxic effects. It must be secreted in sufficient quantities to assure bactericidal effects, but produce no irritation of the urinary tract, and no immediate or delayed deleterious effects on renal function (68).

Intelligent use of any urinary antiseptic presumes knowledge of: (1) the type of infecting organism; (2) the pH of the urine; and (3) the general condition of the patient, including a conception of the state of the urinary apparatus, especially with regard to urinary stasis and the presence or absence of urinary calculi. A Gram stain of the urinary sediment is generally sufficient, as it enables identification of the infecting organism as a bacillus or coccus, and shows whether it is Gram-negative or Gram-positive (33). The great majority of infections are produced by the Gram-negative bacillus, escherichia coli. The other members of this Gram-negative bacillus group are aerobacter aerogenes, pseudomonas, salmonella, proteus, shigella, and alcaligenes. Cultures are necessary for their identification. The cocci, other than the gonococcus, are nearly all Gram-positive, and can generally be distinguished by their appearance on smears. Nitrazine paper offers the quickest and most popular means of pH determination. Although not markedly accurate, it is sufficiently so for office practice and is of great value in routine urology.

ACIDIFICATION

That extremes of pH have an effect on the growth of bacteria in urine was noted by Shohl and Janney (106), bacteriostatic urine having been obtained by reducing the pH to 4.6, and also by raising it to 9.6. Inorganic acidification of urine by means of ammonium chloride, ammonium nitrate (enteric-coated tablets), sodium-acid phosphate, dilute hydrochloric acid, nitro-hydrochloric acid (34), and other drugs is still an accepted method, although at present these drugs are used more as acidifiers in conjunction with methenamine and mandelic acid than as urinary antiseptics *per se*. Sisk and Toenhart (109) directed attention to the value of gluconic acid in cases infected with urea-splitting organisms and the frequent complication of alkaline stones and encrustations. Excess enthusiasm with this class of drugs, however, has been known to produce acidosis, especially when renal function is poor (94).

ALKALINIZATION

Alkalinization to a pH of 8.5 or above, although difficult to maintain, has a bacteriostatic effect in many infections, and often is useful in chronic gonorrhea when other methods fail. Overalkalinization may produce alkalosis or phosphatic calculi if employed chronically (68). The most popular drugs for this effect are the citrates and soda bicarbonates, the latter frequently being used as an accessory to sulfanilamide. Alkalinization seems to alleviate urinary and systemic distress in the febrile states, such as acute pyelonephritis.

METHENAMINE

Methenamine accompanied by an acidifier is a useful drug, especially in chronic cases of low grade infection, because of its low toxicity. The newer antiseptics, mandelic acid and sulfanilamide, are too toxic to be used for long periods, as is necessary in cord bladder and other chronic conditions. The action of methenamine depends on the splitting-off of formaldehyde in an acid urine, and the amount of formaldehyde produced depends almost directly on the degree of acidity, the concentration of methenamine present, and the duration of exposure of the methenamine to the acid urine (55, 71). The dosage is at least 30 gr. a day, and sometimes 45 gr., but larger doses, with the necessary acidifier, may produce considerable nausea and dysuria, and at times renal irritation with hematuria. The use of me-

thenamine is contraindicated in acidosis, peptic ulcer, and febrile states, and it is most valuable in cases of colon-bacillus infections.

KETOGENIC DIET

The chance observation of Helmholz (56, 57), that urine from an epileptic patient, on a ketogenic diet, would remain sterile although standing in a warm room, led to the use of the ketogenic diet for urinary-tract infections. It was first thought that the acidity of the urine produced by the diet was the sterilizing factor, but experiments proved that lowered pH alone would not sterilize the urine, and that a ketonuria must be obtained. Although excellent results were obtained by the use of a high fat, low carbohydrate diet, especially in bacillus-coli infection, by Clark (20, 21, 25), Cook and Braasch (30), and others, the heavy fat content nauseated most of the patients to the point of emesis, and hospitalization became necessary. Several variations of the diet were tried, among them a starvation diet, as suggested by Nesbit and McDonnell (91), calculated to utilize the endogenous fats to produce the desired ketonuria.

Fuller (45) found by chemical analysis that the actual bacteriostatic agent in ketone urine was levo-B. oxybutyric acid, and this substance was administered orally by Cook (27) in the effort to produce its excretion in the urine. However, when it was discovered by Cook and Braasch (30) that the B. oxybutyric acid was oxidized before it could be excreted by the kidneys, it was used locally in a 2 per cent solution buffered to a pH of 4.5. The acid was expensive, but was found by Cook (27), and Helmholz and Osterberg (60) to be quite effective against the bacillus proteus, aerobacter, streptococcus fecalis, and staphylococcus.

MANDELIC ACID

After consideration of all the compounds related to B. oxybutyric acid, Rosenheim (102) ascertained that mandelic acid, which is nontoxic and excreted unaltered, renders the urine bacteriostatic. He emphasized that the concentration of mandelic acid must be at least 0.5 per cent and the urinary pH 5.0 or less, and reported 12 cases of bacillus-coli infection in which he obtained excellent results.

Mandelic acid is usually given orally as the ammonium, calcium, or sodium salt, all of which are readily soluble in water. The ammonium and calcium radicals aid in acidification, opinions differing as to which is the more efficient in this respect. The acid has recently been administered in enteric-coated tablets of mono-ethanolamine mandelate with ammonium chloride (Rupel and Travis, 103), in suppositories for infants (Helmholz, 59), and intravenously in experimental work (McMahon, 89).

The adult dosage of the syrup is 2 drams four times a day, which provides an intake of 12 gm. of mandelic acid. It is necessary to limit the fluid intake to 1,200 c.cm., and thus produce an approximate concentration of 1 per cent of the acid in the urine, since it is excreted almost quantitatively. If the urinary pH does not go below 5.5, it is necessary to add acidifying drugs, an acid-ash diet, or both, as it has been proved that the effect of the drug depends directly on low pH and high concentration. Two weeks at the above dosage is considered a course of treatment, but if results have not been obtained, another course may be given after a few days' rest. Any obstructive lesion of the urinary tract, or tube, drain, or calculus interferes with the action of the mandelic acid; it is considerably enhanced when the infection is superficial, the urine is in direct contact with the infected area, and there is no scarring (Cook, 33).

The results of mandelic-acid therapy are best in chronic bacillus-coli infections (19, 31, 38). Aerobacter and pseudomonas can be eradicated if the mandelic-acid concentration and acidity are sufficiently high, but these organisms are more resistant (19, 38, 61). Proteus ammoniæ is attacked only *in vitro*, as it is usually clinically impossible to obtain a urinary pH of 5.5 in the presence of this urea-splitting organism. Mandelic acid has been indispensable in streptococcus-fecalis infection, since Helmholz (59), Cook (28), and others have found that this organism does not respond to sulfanilamide. Other cocci do not respond well to mandelic acid (Helmholz, 59).

The only toxic effects of mandelic acid are nausea, vomiting, diarrhea, an occasional skin eruption, and hematuria which may be gross or microscopic in amount (28, 31). Experimental overdosage, however, has produced focal necrosis in the liver and kidneys of dogs (19, 61) and a rise in the blood urea of human beings (31) and dogs (89).

Mandelic acid is contraindicated in cases of lowered renal function, since the kidneys can excrete neither the drug nor urine of sufficiently low pH in which the drug will take action.

CAPROKOL

Hexylresorcinol in capsules (Caprokol), from .45 to .75 gm. three times a day, has been successfully used by Leonard (77, 78) as an antiseptic

for urine infected with staphylococci and streptococci. However, it is quite expensive, frequently nauseating, and its antiseptic value has been shown to be inconstant by Thomas and Wang (113), Davis and Sharpe (37), and by Walther (120). Its chief use in clinical work is its action as a urinary-tract sedative. In old people and others unable to tolerate the more efficient drugs used for antisepsis, it may control irritability of the lower urinary tract and thereby indirectly and directly, in a measure at times, effect conditions favorable to the eradication of infection.

DIPHENYLAMINE DYES

The most important members of this group are methylene blue, neutral acriflavine, gentian violet, and mercurochrome 220. Walther (120) states that methylene blue has given good results as an antiseptic *in vitro*, but its clinical application has not been so successful. Boyd (12) believes its chief value is its sedative action when used in cases of irritative lesions of the bladder such as tuberculous cystitis. It is sometimes used during the period of healing following transurethral resections, preliminary to sterilization of the urine with more effective drugs.

Davis (36, 37) states that neutral acriflavine in .2 gm. capsules has given good results, particularly in acute infections. However, the urine must be kept alkaline, and the drug produces considerable nausea and vomiting. It is doubtful if there is ever an indication for its use now.

Mercurochrome 220 was the first intravenous urinary antiseptic to show promise. Young and Hill (127) advise that it be given slowly in doses of from 2 to 5 mgm. per kilogram body weight in a 1 per cent solution intravenously. This dosage may be repeated several times according to indications, but it is best to give only one injection a day. Reactions vary considerably. Sometimes there is nausea and vomiting immediately and a febrile rise of from 1 to 5 degrees within three or four hours after the injection but this subsides rapidly. Mercurial stomatitis and diarrhea occur occasionally, but renal damage has not been noted. Mercurochrome has been of value in pneumonias, erysipelas, septicemia, pyelonephritis, perinephric abscesses, and gonorrhea and its complications, especially prostatitis. In doses of 10 c.cm. of a 1 per cent solution, mercurochrome frequently terminates the febrile phase of an acute pyelonephritis, the type of organism involved not being important. The urine must then be sterilized by other measures (Emmett, 43).

Gentian violet in the intravenous dosage of 5 mgm. per kilogram of body weight produces a severe transitory cyanosis, but has given some results in staphylococcic septicemia, according to the experience of Young and Hill (127). Of this group of drugs, mercurochrome retains the highest degree of usefulness at the present day, being of particular value in cases of urosepsis when the patient cannot take sulfanilamide or when this drug fails for one reason or another.

AZO DYES

Pyridium, serenium, niazo, and mallophene are the chief members of this group. The best known is pyridium, which was found by Walther (120) and Willoughby (124) to retard some strains of bacilli-coli and staphylococci. Thomas and Wang (113), Davis and Sharpe (37), and Gillespie (49) found it to have much better bactericidal action in water than in urine and not to be particularly potent in the latter. The dose is 2 (0.1 gm.) tablets three times a day, which produces a urinary concentration of less than 1:20,000, and colors the urine a brilliant yellow. A recent extensive study by Adair, Dunlap, and Willmert (1) revealed that urine containing eliminated pyridium has no consistent germicidal power, regardless of the pH, although it does suppress the production of staphylococcic toxin *in vitro*. This may account for its beneficial effect in staphylococcic urinary-tract infections.

In general, its clinical effect seems to be restricted to a sedative action on the urinary tract, there being no appreciable favorable action directly on the infecting micro-organisms.

SULFANILAMIDE

Since Domagk's (41) original discovery that paraminobenzene sulfonamide (sulfanilamide) inhibits the bacillus hemolytic streptococcus in mice, this compound has been the object of almost ceaseless praise and investigation as a urinary antiseptic. Its use is divided into the treatment of non-specific infections, and that of gonorrhea.

In non-specific infections, the recommended dosage of sulfanilamide is variously quoted at from 30 to 80 gr. a day for from ten to fourteen days. Alyea, Yates, and Daniel (4) state that it is best given at uniform intervals during the twenty-four hours in order to maintain constant concentration at all times. Since the excretion of sulfanilamide is roughly proportional to kidney function, a dosage of 1 gm. of sulfanilamide for each 10 per cent of phenolsulfonphthalein excreted the first half-hour on the first day, followed by half of this dose each succeeding day, has been recommended by them. This scheme prevents accumulation of the drug in the blood stream

with consequent toxic reaction (86). For children, 10 gr. per 20 lb. of body weight in from four to six doses a day has been suggested, since the drug is better tolerated by the young, according to Helmholz (59). Ten grains of sodium bicarbonate is given with each dose of sulfanilamide, in order to raise the pH of the urine, prevent occurrence of acidosis, and reduce the gastric unrest which frequently accompanies its administration. Sulfanilamide is used almost entirely by mouth, but if the necessity arises, it can be given subcutaneously, intravenously, or per rectum (Clark, 24, Long, Bliss, and Feinstone, 82). It is best to give no other medication with sulfanilamide; this is true particularly of magnesium sulfate and other saline cathartics, as several cases of sulfemoglobinemia have been reported as a result of this combination. At times emergency necessitates combining sulfanilamide with a drug such as insulin or digitalis, and this has been done without reaction, according to Long, Bliss, and Feinstone (82), but in general combinations of other drugs with sulfanilamide are considered dangerous. The drug is much better tolerated by the bed patient than by the ambulatory one, and by younger individuals than by the aged (82, 114).

Sulfanilamide is completely absorbed from the gastro-intestinal tract in four hours (28), and is 97 per cent recoverable in the urine, a negligible amount being excreted in the stools (112). It is, therefore, necessary to maintain adequate renal function and fluid intake; water is the antidote for sulfanilamide (82). The blood concentration varies markedly and depends on the size of the dose and the individual patient. It has been proved that blood concentration varies in different individuals taking the same dosage per pound body weight (112). Sulfanilamide is found in pleural, peritoneal, spinal, joint, and prostatic fluids in only slightly lower concentration than in the blood stream (28, 44, 68). It has also been found in gonorrheal urethral discharge, cervical and menstrual secretions (1), human breast milk (1, 100, 111), fetal blood of rabbits (1), and placenta and cord blood of human beings (1, 111). It has been shown that sulfanilamide raises the fetal mortality rate in rabbits, but the amounts secreted in human milk have been considered non-toxic for nursing infants (100, 111), although this point is debatable.

The mode of action of sulfanilamide, though not thoroughly understood, is considered by Bliss and Long (9) to be that of bacteriostasis, while Osgood and Brownlee (96) believe the action is one of neutralization of toxins, this aiding phagocytosis indirectly by weakening the organisms. There is no direct stimulatory action on phagocytosis. Helmholz and Osterberg (62), Sickler (107), Cook (28), and others have stated that *in vitro* experiments show that the same concentration of sulfanilamide is more effective in alkaline than in acid urine; clinical experience demonstrates the ability of the drug to function equally well in urine at any pH value (31, 69, 74, 81).

Sulfanilamide is effective in varying degrees against bacillus coli, aerobacter aerogenes, pseudomonas, proteus, staphylococcus aureus and albus, micrococcus, streptococcus viridans and hemolyticus, and the gonococcus (28, 35, 58, 59, 62, 68, 82, 117, 118). There is some doubt of its efficiency in staphylococcus infections (24, 35, 118). It is of no value in streptococcus-fecalis infection (24, 28, 35, 117), but this organism is successfully treated with mandelic acid. The urea-splitting bacillus proteus is successfully attacked with sulfanilamide because of the high urinary pH produced by this organism, in which sulfanilamide is particularly active. It has been shown, however, that bacillus proteus, aerobacter, and pseudomonas require a heavier concentration of the drug for eradication, and these bacteria are sulfanilamide-resistant in some cases (24, 82, 118). Of all infections, those produced by the bacillus coli are the most responsive to sulfanilamide (33). It also seems that this drug is more effective in acute than chronic infections (59); in the former it is better tolerated than mandelic acid, and its optimum urinary pH coincides with the optimum pH for treatment of the acute infection. As with mandelic acid, the action of sulfanilamide is interfered with by the presence of residual urine, stones, diverticula, tumors, drainage tubes, abscesses, and freshly operated surfaces (28, 68, 83).

In gonorrhea, sulfanilamide is used in considerably larger dosage than in non-specific infections by most men, an average course being 80 gr. a day for two days, followed by 60 gr. a day for from two to four days, then 40 gr. a day for the remainder of two weeks (10, 38, 39, 104, 108, 117, 118). Many patients, especially those who are ambulatory and working, are unable to take these larger doses because of the toxicity of the drug; thus the trend is toward a lower dosage (90). Good clinical results have been obtained with 40 gr. daily for mild cases and 60 gr. for the severe and complicated cases (70, 105). It is difficult to make an arbitrary dosage outline, however, since there is so much difference in individual tolerance to the drug (69). There is no relation between blood concentration or urine concentra-

tion and the percentage of cures (4). It has been shown that sulfanilamide is excreted in the free and acetylated form (10, 119), the latter form being a less potent gonococcidal agent (82). Since the percentage of sulfanilamide which is acetylated varies in different patients, this may be a factor in the variable potency of the drug in gonorrhea. Soda bicarbonate (10 gr.) is generally given with each 10 gr. dose of sulfanilamide up to four doses. The effect of the drug is considerably enhanced by simultaneous local treatment (70, 104, 108) and such general measures as were in vogue before its advent.

Results obtainable with sulfanilamide in gonorrhea are quoted with marked variance; the cures range from 27 per cent to 95 per cent (10) in from seven to twenty-one days, and depend on dosage, co-operation, tests of cure, and period of follow-up. Sulfanilamide definitely prevents the occurrence of complications (38, 70, 108, 117). Its wide-spread secretion in all parts of the body makes it of definite value in the treatment of complications which have already occurred (28, 44, 68); it is of special value in acute gonorrheal prostatitis. Little or nothing can be expected of sulfanilamide in lesions which have no drainage and no blood supply (6, 108). Sulfanilamide produces a substantial percentage of symptom-free gonorrheal carriers (70, 95), and some 10 to 20 per cent of all patients cannot take the drug because of its marked toxicity (31, 35, 105, 108, 117).

Sulfanilamide has been accused of producing almost as many toxic reactions as cures. The mild reactions, which are also the most common, include nausea, vomiting, headaches, dizziness, drowsiness, malaise, and various low grade pains, usually in the back and legs (7, 10, 35, 47, 82, 85, 117). These generally do not necessitate complete stoppage of the drug, but often call for lowered dosage. They may be warnings of the more serious reactions to follow.

Fever occurs in from 5 to 10 per cent of cases (47, 52, 82) either immediately after the first dose, or after a latent period of from forty-eight to seventy-two hours, and is frequently the forerunner of some more serious complication, as a skin rash or blood dyscrasia (125). Sulfanilamide produces either a mild chronic anemia (125), or an acute hemolytic anemia (5, 53, 75, 125), the latter being more dangerous but not so common. It calls for immediate stoppage of the drug and frequent blood transfusions. Agranulocytic angina occurs rarely, is a serious complication, and calls for transfusion, pentnucleotide, and stoppage of the drug (47, 126).

Cyanosis of some degree appears in a high percentage of sulfanilamide patients (87), but is not necessarily dangerous unless it becomes marked. It may be the result of methemoglobinemia, or of an unanalyzed black oxidation product in the red blood cells (117). Acidosis is a rather frequent occurrence, the incidence of which can be lowered by the concomitant use of sodium bicarbonate. Optic neuritis (96), peripheral neuritis (95), hepatitis (46, 47), various psychoses (47), inhibitory effects on spermatozoa (73), and wound healing (15), are more rare manifestations which have appeared.

The skin rash of sulfanilamide is usually of a maculopapular type, and it may cover the entire body, or only those surfaces exposed to light (50, 92). All of the mild reactions and most of the severe ones subside within from twenty-four to forty-eight hours after stoppage of the drug and administration of forced fluids, the antidote of sulfanilamide being water.

NEOPRONTOSIL

Neoprontosil, because of its lower toxicity (7), is a valuable substitute for sulfanilamide. It is rapidly absorbed from the gastro-intestinal tract, and produces a smaller amount of free sulfanilamide in the blood than is produced by sulfanilamide (29). When eliminated in the urine it produces a pink color and frequently lowers the urinary pH. Its effect approximates that of sulfanilamide but is not as marked because of its rapid elimination and low blood concentration (7, 65). The dosage is from 40 to 60 gr. a day (7). The drug is also available in liquid form for intramuscular or subcutaneous injections. The percentage of toxic reaction is quite low, but it has been noted that patients with sulfanilamide idiosyncrasies will frequently exhibit the same reactions when given neoprontosil. Because of its low toxicity, the drug is valuable in chronic, debilitated states, and for older people (29).

DISULFANILAMIDE

Disulfanilamide (sulfanilyl-sulfanilamide, or disulon), another sulfanilamide derivative, in doses of 45 gr. a day for from eight to ten days (93), approximates the efficiency of sulfanilamide in gonorrhea, some authorities claiming a slight superiority for disulfanilamide (93). A recent report states that this drug cured 55 per cent of a series of 40 cases of sulfanilamide-resistant gonorrhea (3). However, the serious complication of peripheral neuritis occurred in .8 per cent of a group of 3,000 patients. The neuritis is evidenced by pain in the calves of the legs, difficult walking,

weakness in flexion of the ankles and toes, weakness in grip, and abduction of the thumbs (121). Recovery has been slow, and usually amounts to 50 per cent of normal function. The dosage producing this damaging lesion has varied from 30 to 40 gr. a day for from two to four weeks. It is doubtful if its gonococcidal effect is sufficiently valuable to warrant risking this complication (99).

DIMETHYL DISULFANILAMIDE

Uleron (dimethyl disulfanilamide) has obtained considerable reputation, especially among German and English writers, for its effect in subacute and chronic gonorrhea. Given in three short courses of 12 gm. a day for three days and combined with local irrigations (123), it is thought to be particularly valuable in infections which have progressed for ten days or more. This conception is responsible for the practice of giving no oral treatment for the first ten days (48), which is popular in Europe but not generally accepted in this country. However, a high percentage (54 to 90 per cent) of cures in chronic cases have been reported. The toxicity is low (7), except for a number of cases of peripheral neuritis (76, 115, 123), which is a complication damaging enough to warrant considerable attention, and which can frequently be avoided by short courses as recommended.

SULFAPYRIDINE

Sulfapyridine, which has not had an adequate trial in non-specific urinary-tract infections, is far superior to sulfanilamide in gonorrhea (66). It is irregularly absorbed (80, 84) and slowly excreted in both the free and acetylated forms in urine. The dosage in gonorrhea is from 15 to 25 gm. over a period of from five to seven days (11), generally as follows: first and second days 60 gr. daily, third and fourth days 45 gr. daily, fifth and sixth days 30 gr. daily. The drug is best administered with milk in order to alleviate gastric distress due to its use, and simultaneous local treatment is necessary (33, 66). After the first twenty-four hours it is generally impossible to locate a gonococcus on direct smear, and from five to six days suffice to completely cure 90 per cent of the acute, uncomplicated cases. Factors which tend to lower the effectiveness of sulfapyridine and require more of it are previous chemotherapy and chronicity of the lesion (66). Failures are due to poorly draining lesions, an inadequate blood supply to the infected foci, and poor co-operation. Practically no complications have been reported in sulfapyridine-treated cases, and the drug is of marked value in posterior and adnexal infections (8, 83, 88, 101). Sulfapyridine leaves no asymptomatic carriers.

Toxic reactions from sulfapyridine are apt to be comparable to those from sulfanilamide (42, 85) and include nausea, vomiting, dizziness, headache, cyanosis, fever, anemias, agranulocytosis (40), dermatoses, and paresthesias. Acidosis has not been reported.

The most frequently reported serious complication following sulfapyridine is the combination of hematuria, abdominal pain, nitrogen retention in the blood, and urinary calculi (8, 110). This syndrome is doubtless the result of concretions of acetylsulfapyridine which are formed in the collecting tubules of the kidney and thus produce the hematuria and nitrogen retention mechanically. They have at times become large enough to occlude the ureters (116). These calculi have been produced experimentally by a dosage of 1 gm. of sulfapyridine per kilogram in rats (51). Since the limited solubility of acetylpyridine and sulfapyridine is probably responsible for their precipitation it is suggested that an increased fluid intake might be a good prophylactic measure. Also, short courses as outlined should prevent accumulation of the calculi.

Herrold (66) has found, after a careful study of comparable series of patients, that sulfapyridine is from two to three times as effective as sulfanilamide in the treatment of gonococcal infections. While there is a higher incidence of mild toxic reactions after the use of sulfapyridine as compared with sulfanilamide, the incidence of severe toxic reactions is minimal, at least partly because of the short course of administration necessary for the desired therapeutic results.

SULFAMETHYLTHIAZOL

As just noted, sulfapyridine is especially valuable in the treatment of pneumococcus, gonococcus, and certain types of staphylococcus infections. There is no question, however, that troublesome toxic manifestations frequently follow its use. Search for a less toxic but as efficient a drug has resulted in the production of sulfamethylthiazol. Herrell and Brown have found it especially effective against staphylococci, especially in the presence of abscess, cellulitis, or staphylococcemia.

NEO-ARSPHENAMINE

Neo-arsphenamine, in addition to being antiluetic in its action, is also a potent urinary antiseptic. It should be given in .3 gm. injections intravenously once or twice a week for 6 doses (16). From 3 to 10 per cent or the total arsenic

has been found excreted in the urine, the highest concentration during the first hour. The exact chemical structure of the excreted arsenic is not known, but neo-arsphenamine in low concentrations is bactericidal for the micrococcus, streptococcus fecalis, and staphylococcus aureus (97). It is of particular value in staphylococcal infections (13, 35, 18, 63, 129), the class designated sterile pyuria (16, 72, 122), and has also been recommended in brucellosis of the urinary tract (22). Foci of infection harboring these organisms must be removed, however, before the neo-arsphenamine will have any lasting effect (16, 122). The value of this drug cannot be overemphasized and should never be lost sight of, in staphylococcal infections in particular.

SUMMARY

Bacteriologically speaking, no single antiseptic will suffice for all infections. Sulfanilamide or mandelic acid will eradicate nearly all Gram-negative bacillurias, sulfanilamide being the drug of choice in bacillus-proteus infections.

The cocci as a group are more apt to respond to sulfanilamide or neo-arsphenamine, with one exception, streptococcus fecalis, which responds only to mandelic acid.

Sulfapyridine is definitely more effective than either sulfanilamide or its other derivatives in gonococcus infections.

Neo-arsphenamine is the drug of choice in amicrobic pyuria, and often in staphylococcuria.

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GENITO-URINARY SURGERY

ADRENAL, KIDNEY, AND URETER

Narath, P. A.: The Hydromechanics of the Calyx Renalis. *J. Urol.*, 1940, 43: 145.

The author presents a detailed study of the hydromechanics of the calyx renalis. He describes in detail the musculature of the calyx. He describes some muscle fibers which extend from the fornix alongside the papilla between the tissue and the fat of the sinus renalis and he terms these fibers the "musculus levator fornicis."

He then describes other muscle bundles which act as a sphincter to the fornix; these were previously described by Henle. These he calls the "musculus sphincter fornicis."

From this area are longitudinal fibers in the wall of the calyx which extend into the wall of the true pelvis. These he calls the "musculus longitudinalis calycis."

Between the neck and the true pelvis are another group of muscle fibers which are known as the "musculus sphincter calycis."

The author refers to two phases in the motion of the calyx, first, a collecting phase and, second, an emptying phase; in other words, diastolic and systolic phases. During the collecting stage, the sphincter calyces muscles are contracted, the levator and sphincter fornices muscles are both relaxed, and the sphincter of the pelvis is relaxed, whereas in the emptying or systolic phase the levator and sphincter fornices muscles are both contracted, the sphincter calyces muscles are relaxed, and the sphincter of the pelvis is contracted.

The author was unable to demonstrate any sphincters at the necks of the calyces minores. He states that only the calyx major seems to have a sphincter.

The author then describes his method of study: retrograde pyelographic study with the occlusion type of ureteral catheter.

The author takes exception to the terminology employed today. He suggests the term "pyelo-canalicular back flow." This term applies to the reflux into the tubular system of the kidney. He states that the fornix absorbs the pelvic content into the sinus renalis when excess pressure occurs. He further suggests "pyelo-sinous transflow" is more acceptable than extravasation, for he has shown that the fluid enters the sinus renalis without intrapelvic pressure.

The author then discusses various shapes of pyelosinous transflow. The terms he uses are: horn-shaped, multiform, planelike, and ribbon-like.

The author states that a pyelovenous backflow is difficult to demonstrate in a roentgenogram, whereas sinolymphatic absorption can be and is demonstrated by various interesting pyelograms, which refutes to a degree the opinion of Hinman. However, the author has illustrated some sinovenous ingression. He substantiates some of his statements by employing intravenous urography in a case of sinolymphatic absorption, which is well illustrated.

Sinovenous ingression is used as an indication of a rupture or injury of the fornix and subsequent entrance of the fluid into the vein, and sinolymphatic absorption occurs rather frequently with sinovenous ingression.

The subject matter is well presented and illustrations are of material benefit in explaining the hydromechanics of the calyx renalis.

J. Sydney Ritter, M D.

Corwin, W. C.: Multiple Adenomas of the Kidneys. *J. Urol.*, 1940, 43: 249.

The author reports the autopsy findings in a white male, fifty-three years of age, who was admitted to the hospital with a diagnosis of hypertensive cardiovascular disease with cardiac decompensation.

Both kidneys weighed approximately 220 gm. The renal arteries were stiff and thickened and scattered diffusely in the external surfaces, and throughout the cortical substance were scores of grayish-white nodules measuring from 1 mm. to 2 mm. in diameter; these nodules resembled miliary tubercles. The histological findings of these nodules suggested a papillary cystadenoma.

This condition is comparatively common in late adult life. Although the nodules may attain greater size, they are usually no larger than a pea, and are often smaller. In this case, great numbers of arterioles showed moderate hyaline thickening, yet there was nothing more than hyalinization of some of the glomeruli to indicate renal damage. There was no evidence of true nephrosclerosis. The dilatation, hypertrophy, and hyperplasia of some of the tubules, so frequently noted in diseased kidneys, have been shown by Oliver, Lund, and Luey to be due to hyalinization of the corresponding glomeruli. Such tubular changes may lead ultimately to the formation of true adenomas. Most authors are in agreement that papillary cystadenomas are derived from tubular epithelium, and many believe that malignant transformation may result in the typical Grawitz tumor.

Elmer Hess, M.D.

BLADDER, URETHRA, AND PENIS

Ladd, W. E., and Lanman, T. H.: Exstrophy of the Bladder and Epispadias. *New England J. Med.*, 1940, 222: 130.

Seven additional cases of exstrophy of the bladder are added to 15 previously reported, in which bilateral ureterosigmoidostomy was performed. This grand total of 44 ureterosigmoidostomies in 22 patients was devoid of mortality, and functional results have been satisfactory in the cases observed to date. Several points are emphasized by the authors:

1. A three-stage operation.
2. Transplantation of the right ureter first and of the left from two to four weeks later.
3. The transperitoneal approach for ureterosigmoidostomy, no catheter or guide being left, but the proximal end of the ureter should be opened widely by a longitudinal split.
4. No drainage of the peritoneal cavity.
5. Removal of the bladder as soon as is practicable after ureteral transplantation.
6. Operation should be performed, preferably, between three and five years.

Follow-up studies of earlier cases by intravenous urography six or seven years after transplantation show little if any evidence of dilatation of the ureters or renal pelves. More dilatation of the ureters was often noted during the first two years than was evident subsequently. This, it is explained, probably represents physiological readjustment to the transplantation.

Apart from the actual diversion of the urinary flow into the bowel, the authors stress several important factors involved in the successful termination of correction of the congenital anomaly. These factors are:

1. Removal of the pouting exstrophied bladder.
2. Cure of the ever-present ventral hernia.
3. Plastic reconstruction of the urethra with possible restoration of sexual function.
4. Cosmetic improvement, which is important psychologically, particularly in the male.

To successfully effect such restoration, one of the authors (Ladd) has devised an operative technique representing an adaptation and combination of principles used by others into a single operation which has yielded gratifying results. This operation is undertaken some three to five weeks after ureteral transplantation. It is emphasized, however, that since a long anesthesia is required and bleeding may be appreciable, complete recuperation from previous surgery is essential. Often, weeks or months are allowed to elapse and during this interval the child can lead an active and more normal life than prior to diversion of the urinary stream. In addition, urinary control is acquired, making convalescence from the third operation much more comfortable.

Principal features of the operation include avertin, nitrous oxide and oxygen, and ether anesthesia; preparation of the patient includes cleansing the bladder with soap and water, followed by alcohol, and one-third strength iodine solution to the surrounding skin, and in boys, it includes cleansing of the genitalia; excision of the bladder by elliptical incision; correction of the ventral hernia by means of a large generous fascial flap obtained from the right rectus muscle and sutured over the triangular defect. In boys, correction of the epispadias is effected by retaining a flap of vesical mucosa, which is used to form a roof for the reconstructed urethra; use is made of the redundant prepuce to cover the newly formed urethra, after the method of Ombrédanne.

The authors believe that a properly performed operation, as detailed, has little chance of failure. Infection is a danger but can be minimized by proper technique since the passage of urine is obviously not a factor. By this technique, a much stronger abdominal wall is created, and in correction of the epispadias a passage is created, which should remain patent from the ejaculatory ducts to the end of the penis. Functional results must await a sufficient lapse of time and the authors look forward to possible future plastic procedures, if necessary, and the possibilities of the application of sex hormones as the patients approach puberty. While functional results must thus await future consideration, it is believed that anatomically a satisfactory cure of the ventral hernia, a more comfortable pubic area, and an improved cosmetic appearance with a decrease of bad psychological effects of the malformation are obtained.

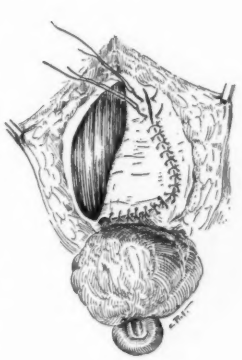


Fig. 1.

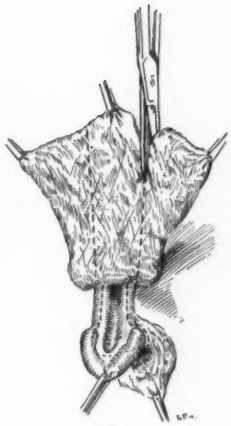


Fig. 2.

Fig. 1. Bladder free and turned down, and the method of closing the ventral hernia with the fascial flap.

Fig. 2. Shows the flap of bladder being cut to form the roof of the new urethra.

ARTHUR H. MILBERT, M.D.

Langworthy, O. R., Drew, J. E., and Vest, S. A.: Urethral Resistance in Relation to Vesical Activity. *J. Urol.*, 1940, 43: 123.

In a short review of the existent literature the authors point out the differences of opinion on recent investigations as to the factors involved in urethral resistance and relaxation. They found that a considerable portion of urethral resistance lies in the mechanical pressure of the perineum. Sudden pressure in the urethra causes a contraction; gradual distention leads to relaxation. Stimulation of the pudendal nerves caused a contraction of all perineal muscles; section of these nerves produced no change. Stimulation of the parasympathetic fibers produced relaxation; section produced no significant change. Stimulation of the sympathetic fibers stopped a flow of fluid in the urethra; bilateral removal produced

very little effect. Section of the posterior sacral roots produced variable results.

From this experimental work the authors speculate as to the condition of the sphincters in shock, spinal-cord injury, spina bifida, tabes dorsalis, cortico-spinal injury, and parkinsonian syndrome.

They conclude that abnormalities of micturition due to injury of the nervous system are dependent primarily upon their effect on the detrusor muscle and secondarily to changes in urethral resistance, the term "sphincter disturbances" being a misnomer.

DONALD K. HIBBS, M.D.

GENITAL ORGANS

Heckel, N. J.: The Influence of Testosterone Propionate upon Benign Prostatic Hypertrophy and Spermatogenesis: A Clinical and Pathological Study in the Human Being. *J. Urol.*, 1940, 43: 286.

Because of the many favorable results recently reported from the use of male sex hormone in the treatment of benign prostatic hypertrophy, it seemed timely to carry out a series of clinical investigations with this material on patients so afflicted. It is the opinion of some investigators that prostatic hypertrophy may be the result of a disturbance in the balance of the endocrine system, and that the prostate gland can be influenced by the gonadotropic and sex hormones. In support of this theory, the author offers his experimental evidence obtained from animals and man.

THE INFLUENCE OF TESTOSTERONE PROPIONATE UPON PROSTATIC HYPERTROPHY

Twenty-two unselected patients were observed. Testosterone propionate was given intramuscularly and in a majority of the patients in daily injections of from 5 to 30 mgm. They were treated for from seven to fifty-six weeks, with varying amounts ranging from 560 mgm. to a maximum of 3,200 mgm. The results following treatment show no marked improvement in the symptoms or clinical course of the hypertrophy.

Prostatic tissue from 9 patients who had a transurethral resection was studied histologically and compared with microscopic sections from untreated patients. There was no definite evidence of difference between the histological findings in the treated and untreated patients. Many of the cases are reported in brief and the analysis of the 22 cases was very disappointing. The clinical results were certainly not nearly as favorable as those which are consistently reported by a majority of other investigators. There is no explanation for this.

THE INFLUENCE OF TESTOSTERONE PROPIONATE UPON THE PHYSIOLOGY OF THE TESTES

Fifteen patients were observed over a sufficient length of time to justify certain deductions on the effect of testosterone propionate upon spermatogenesis. Of the 15 patients under observation, 10 had spermatozoa counts within normal limits, 2 had moderate oligospermia, and 3 had an extreme oligospermia of undetermined cause before treatment was started. Ten of the 12 patients, including the 2 that had a moderate oligospermia, showed a great depletion of spermatozoa as a result of the treatment. It is acknowledged that great care must be exercised in the evaluation of the influence of any agent upon the number of spermatozoa, because the possibility of error in calculation is not less than 10 per cent. However, the regularity with which the spermatozoa counts could be lowered, coincident with the administration of the testosterone propionate, appears to leave little doubt as to its effect.

It is to be concluded, according to this series, that the clinical use of testosterone propionate in prostatic hypertrophy does not produce any clinical reduction in the residual urine, that it has had no effect upon the histological picture, that it produces a temporary depletion of spermatozoa when the spermatozoa counts are within normal limits, and that in 10 of the 12 patients an oligospermia was produced. Therefore it is the opinion of the author that it is of little or no benefit in the treatment of benign prostatic hypertrophy and its promiscuous use over a long period of time in patients with normal testicular function may be definitely harmful.

ELMER HESS, M.D.

Ljunggren, E.: The Diagnosis and Treatment of Tuberculous Epididymitis (Zur Diagnostik und Therapie der Nebenhoden-Tuberkulose). *Acta chirurg. Scand.*, 1939, 83: 307.

The author reports upon 68 cases of genital tuberculosis in males treated at the surgical clinic of the Maria Krankenhaus in Stockholm, all of which were operated upon. The diagnosis was confirmed pathologically and anatomically. The age incidence was as follows: from fifteen to nineteen years, 13 cases; from twenty to twenty-nine years, 24 cases; from thirty to thirty-nine years, 14 cases; from forty to forty-nine years, 9 cases; and from fifty to fifty-nine years, 8 cases. This shows that the most frequent incidence occurs in the third and fourth decades. In this series the involvement from fifteen to nineteen years was greater than is usually reported. In the large majority of the cases the tuberculous epididymitis was secondary to an earlier tuberculous process in another part of the body; this was often demonstrable at necropsy. The clinical demonstration depends partly on the thoroughness of the examination of the patient. In all cases suspected of tuberculosis roentgenography of the lungs was carried out. Urethrography was done in all cases of prostatic involvement.

In at least 60 per cent of the cases tuberculous infection of the lungs or of the hilar glands was demonstrable, but only in 25 per cent was an active pulmonary tuberculosis evident up to the time of operation. Nine patients were treated previously for bone tuberculosis, and 4 of these also had pulmonary tuberculosis. In 50 per cent of the cases

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 1. A small seed-sized cavity filled with contrast medium on the right side.

Fig. 2. Showing many cavities in the prostate filled with contrast medium.

Fig. 3. One of the seminal vesicles filled with contrast medium. No definite prostatic changes.

renal tuberculosis had either been present previously, was present simultaneously, or else occurred later. For this reason all patients with tuberculous epididymitis should be examined urologically for the possible presence of simultaneous renal tuberculosis, even if tubercle bacilli are not found in the urine.

While it is often stated that genital tuberculosis may be primary in the epididymis, it is much more often found to be primary in the prostate or seminal vesicles, from which organs the epididymis is involved secondarily. Tuberculous changes in these organs are sometimes demonstrable by rectal palpation; however, not only may small tuberculous foci escape detection, but even extensive tuberculous changes in the prostate with cavitation may be overlooked during palpation. A valuable diagnostic aid to complement palpation is urethrography. All patients in whom prostatic changes are palpable per rectum may reveal a normal urethrogram; however, tuberculous nodes and cavities undoubtedly exist in these cases but show no connection with the urethra on examination. In other cases palpation per rectum may give the impression of a poorly defined prostate of somewhat irregular consistency, the prostate consisting only of a shell about an enormous cavity.

Urethrography was carried out 28 times, and contrast filling of smaller or larger cavities was demonstrated in the prostate, or in the seminal vesicles (1 case). The size of these cavities varied from that of a pea to that of a hazelnut (Fig. 1); the large cavities were solitary and the small ones multiple, resembling a bunch of grapes (Fig. 2). In 12 cases with prostatic cavities a relief of the colliculus was visible. In nearly one-third of 14 cases (8 with a normal urethrogram, 3 with only elongation and 1 with dilatation of the supracollicular portion of the urethra, and 2 with prostatic concretions) the palpatory findings per rectum were considered as typical for tuberculosis. In the remaining cases the prostate was considered as normal or atrophic. Thus by rectal palpation and urethrography, tuberculous changes in the prostate or seminal vesicles (Fig. 3) were demonstrated in 65 per cent of 28 cases. In the cases in which urethrography confirmed the presence of cavities, the patients were asymptomatic, except 1 who had dribbling after urination.

However, the urethrographic demonstration of contrast-filled cavities in the prostate does not, in itself, justify the diagnosis of tuberculosis, as non-specific prostatitis with abscess formation may present a similar urethrogram. In prostatic tuberculosis, contrast-filled prostatic ducts are rarely seen, but they are common in non-specific prostatitis.

In the differential diagnosis between tuberculous and non-specific epididymitis, a definite diagnosis is sometimes possible only in the presence of tuberculous changes in the prostate. If the palpatory findings per rectum are normal, or if there is only a suspicion of tuberculosis, the urethrogram may be of great help. Roentgenography of the epididymis is only of slight value, as only in 1 case could calcium shadows characteristic of tuberculosis be found.

When the differential diagnosis between tuberculous and non-specific epididymitis is impossible, an epididymectomy should be done, as with too long waiting there is the danger of involvement of the testis. Surgery is contra-indicated only when the general condition is so poor, because of disseminated tuberculosis, that surgical treatment of the genital tuberculosis is useless. The method of choice is epididymectomy. If the testis is only slightly affected, a resection of the testis is indicated. With extensive testicular involvement, or if an epididymectomy cannot be done without disturbing the blood supply of the testis, semi-castration is indicated. Ten cases were bilateral when seen. In the 58 other cases (unilateral) epididymectomy was done 39 times. There were 14 recurrences. Semi-castration was done 19 times, and recurrence in the other epididymis occurred in 13 of these cases. In 55 cases the fate of the main testis after epididymectomy was determinable. The testis was intact in 40 cases; in 10 cases

it was secondarily extirpated, and in 5 cases it had atrophied extensively. Thirty-one per cent of the patients who were operated upon died within five years from some tuberculous disease (pulmonary, renal, or miliary tuberculosis). It is important, therefore, that patients who have had an operation for tuberculous epididymitis are placed under continuous medical observation with climatic and dietetic after-treatment. LOUIS NEUWELT, M.D.

De Albuquerque, J.: A Clinical and Therapeutic Study of Retrospermism (Estudo clinico-therapeutico do retrospermismo). *Arch. brasil. de andrologia*, 1939, 1: 113.

De Albuquerque states that retrospermism is a relatively infrequent condition, which is characterized by the absence of ejaculation because the sperm is projected backward into the bladder. Normal ejaculation occurs through a mechanism that may be divided into two phases: one of action on the medullary centers of ejaculation and one of action on the membranous sphincter. There is no synergic action in this mechanism: while one series of reflexes promotes expulsion of the sperm, another series increases the contraction of the membranous sphincter and opposes expulsion; ejaculation occurs when the resistance of this sphincter is overcome. If for some pathological reason the contraction of the sphincter cannot be overcome, the sperm back of it does not remain in the urethra, but succeeds in passing the site of minor resistance, i.e., the vesical sphincter, and penetrates into the bladder. The etiology of retrospermism is not easy to understand, but one thing is certain: all factors which are capable of producing asthenia of the sacral ejaculatory center or spasmodic contractions of the membranous sphincter may act as determining causes of the disorder.

The absence of ejaculation during coitus is never the symptom that brings the patient to the physician, because the patient has an orgasm and accompanying urethrorrhea of the secretion of the urethral glands which he confuses with ejaculation. The diagnosis of retrospermism is usually incidental when an examination of the sperm is made necessary by the presence of some other morbid symptom and no sperm is found on the plate or in the condom. It is then necessary to differentiate between (1) aspermatism, (2) oligospermism, and (3) retrospermism.

Aspermatism may be due to a complete lack of production of the sperm, or of its elimination; the first is extremely rare, but the second is rather frequent in cases of cauterization of the verumontanum performed by an inexperienced physician and resulting in cicatricial obstruction of the orifices of the seminal canals and of the prostatic utricle. Orgasm is nearly always absent or greatly reduced.

Oligospermism consists of a reduction in the quantity of sperm and a decrease or even complete lack of the orgasm.

Consequently, the diagnosis of retrospermism rests on the presence of frank orgasm and on the examination for spermatozoids or other elements of spermatic origin in the urine obtained by suprapubic vesical puncture. Retrospermism may cause mental disturbances, such as phobias or inferiority complexes, which may lead to sexual impotence of psychogenetic nature. The treatment is causal. Spasmodic contraction of the membranous sphincter may be due to the presence of a foreign body or of some irritating disorder in the urethra, or to the nervous condition of the patient; these causes must be eliminated. In addition, the galvanic current is recommended in local application to the territory of the perineal branch of the internal pudendal nerve; it may also be applied intra-urethrally to the sphincter, but this method gives less satisfactory results and the introduction of the sound-electrode into the urethra may aggravate the process by irritating the excitable region. In external applications, the positive electrode is placed on the perineum and the negative electrode above the pubis, and a current of from 15 to 20 ma. is used. Resection of the perineal branch of the internal pudendal nerve is condemned. In case of atony of the sacral ejaculatory center of obscure origin, perineal galvanization is useful because it facilitates the work of the ejaculatory center by reducing the spasm of the membranous sphincter. The legal, moral, and social aspects of retrospermism are discussed. RICHARD KEMEL, M.D.

Graves, R. C., and Flo, S.: Carcinoma of the Scrotum. *J. Urol.*, 1940, 43: 309.

After reviewing the literature, the authors report 12 cases of carcinoma of the scrotum from the Pondville Hospital, Walpole, Massachusetts, and 2 cases seen at the Westfield State Cancer Unit. The average age of the patients was fifty-two and seven-tenths years, the oldest being seventy-six and the youngest thirty-two. Only 1 patient was shown to have a family history of cancer. There was a definite history of exposure to oil in 9 patients, 3 of whom were mule spinners. The duration of exposure to oil varied from three and one-half to twenty years. One patient gave a history of having scrotal psoriasis over a period of thirty years. The original scrotal lesion was a pimple in 4 cases, an ulcer in 7 cases, and in 3 cases the lesion was proliferative from the beginning. The delay in consulting a physician averaged ten and two-tenths months in 11 cases. There was no special predilection for either side or for any particular region of the scrotum.

Metastases, when present, practically always occurred in the inguinal and femoral glands, but in 1 case the para-aortic glands were involved. Groin metastases were present in 10 cases, unilateral on the side of the tumor in 4; in 2 of these the tumor was of Grade I malignancy, and in the other 2 of Grade III. Both groins were involved in 5 cases. Cross-metastases were found in 4 cases. In every case in this series the condition was diagnosed as carcinoma or epidermoid carcinoma. Six carcinomas were of Grade I malignancy, 4 were of Grade II, 2 were of Grade III, and in 2 cases no report was given.

The average time of the discovery of metastases was nine months in 11 cases, the time varying from almost immediately to twenty-four months. The total duration of life, from the onset of disease until death, averaged twenty-one months in 11 cases.

In treatment, irradiation should not be relied upon for the destruction of this tumor. The metastatic process in the groin seems stubbornly resistant to x-ray therapy, while the thin scrotal wall, almost lacking in normal tissue defenses beneath the primary growth, offers a poor field for the use of radium or x-rays. From the anatomical standpoint, surgery should include complete removal of the entire scrotum together with the skin of the base of the penis and the nodes of the groins *en bloc*, because this is a lymph-borne disease and there is an unusually free communication among the lymphatics of this region. Fortunately, pathological and clinical evidence suggests less drastic procedures. The lymph-embolic mode of dissemination of this cancer renders it futile, probably, to attempt to remove the intervening channels between the tumor and the glands; and further support of this view is found in the fact that there has been seen no instance of local recurrence in the scrotum after adequate local excision has been performed, even in this series with eventual high mortality. The growth-involved portion of the scrotum must be excised completely, with a wide margin of normal scrotal wall around it. There is undoubtedly some degree of direct permeation along the lymphatics in the immediate vicinity of the tumor. When the lesion lies near the median line, the dissection should extend well upon the opposite side, for the raphe has no significance so far as the lymphatics are concerned and their pathways are continuous from one side to the other. Electrosurgery is desirable because it aids in the control of hemorrhage.

It is wise to sacrifice the testicle and to divide the spermatic cord well above the external ring, at least on the side of the tumor, because if both gonads are spared, with the more extensive excisions it may be impossible to close the remaining portion of the scrotum. Both groins must be dissected radically and completely. On the tumor side, the incision around the neoplasm may be continued upward and outward, a little above and parallel to Poupart's ligament, to within 2 cm. of the anterior superior spine; then it curves widely downward and inward across the lowest level of the femoral triangle. By turning medially the resulting broad-based flap of skin, ready access is gained to the inguinal and femoral regions so that all of the gland-bearing tissues may be removed *en bloc*, with the tumor and testis and cord. Another plan is to continue the scrotal incision upward and outward only, until it communicates with a groin incision which curves in the other direction, beginning near the anterior superior spine, extending above Poupart's ligament to the pubic spine, and then curving widely downward and outward across the lower portion of the femoral region. The flap is dissected laterally to obtain access to the gland-bearing area. These curved incisions help to avoid sharp corners and acute angles which seem to invite necrosis.

Every radical groin dissection must be carried out with meticulous attention to the lymphatic anatomy. The lateral limit of the dissection should not be farther than 2 cm. from the anterior superior spine so that the outermost gland of the inguinal group is included with the tissue removed. To insure removal of the most inferior gland, which lies parallel with the saphenous vein, in the infero-internal group, the lower limit of the dissection should be at least 3 in. below the saphenofemoral junction. The femoral sheath should be opened and the deeper nodes should be sought, especially in the region of the femoral canal. The radical dissection of the opposite groin may be carried out through an entirely separate incision and, as is often preferable, at a later operation. LOUIS NEUWELT, M.D.

Wesson, M. B.: Tumors of the Testicle: Report of Some Unusual Cases. *Brit. J. Urol.*, 1939, 11: 338.

The author stresses three things regarding testicular tumors, which he considers of primary importance: (1) the frequency of occurrence, (2) trauma as a causative agent, and (3) formal treatment.

He reports 7 very interesting cases: 4 of semīnoma, 2 of malignant teratoma, and 1 of a cyst filled with cholesterin crystals simulating a teratoma. He is of the opinion that tumors of the testicle occur much more frequently than we are led to believe from the literature, for many cases do not reach the urologist.

He contends and quotes Ewing that a single trauma of normal tissues is incapable of producing a malignant tumor. He follows this statement up with a case of Dean's, in which the testicle had to be completely removed because of an injury, and in which a small malignant teratoma was found in the testicle by the pathologist.

Furthermore, he quotes Ewing that there is no evidence to show that a tissue rest has been incited to growth by a local injury, and that tumors are retarded in their growth rather than accelerated by trauma.

In tumor treatment, he disregards the radical operation of Chevassu because, although it is anatomically simple, it is not necessarily free from complications. Moreover, the removal of the glands from only one side is hardly enough when metastasis is present in the side opposite from the location of the tumor. In all of the author's cases, surgery of the lymphatic glands was followed by x-ray therapy. Only in the case in which insufficient x-ray therapy was employed were the results very poor.

The author summarizes his article as follows:

1. The presence of teratoma is unknown to the host until it becomes sufficiently large to manifest itself subjectively or objectively. Frequently the pain or tumor is first noticed after a slight strain or trauma, and consequently the latter is assumed to be responsible for a condition that has long been present but has just taken on active growth.

2. The shortest period of time from the first evidence of the presence of testicular pathology until the occurrence of death from metastases was seventy-five days.

3. Orchidectomy followed by ample deep x-ray therapy is the therapy of choice.

4. Two patients are reported alive and well following conservative treatment, at the end of approximately fifteen years.

5. All swellings of the testicle are not malignant. If a course of pre-operative deep x-ray therapy is routinely given to all tumors of the testicles, undoubtedly many benign lesions will be unnecessarily treated, and some never correctly diagnosed. Castration should be done as soon as the diagnosis is made because metastasis frequently occurs early, even before the presence of a palpable tumor. A maximum deep x-ray treatment should be given as soon as the patient is admitted to the hospital (to obviate cancer cells being freed by palpation), and this promptly followed by orchidectomy.

6. A case of gynecomastia as a complication of teratoma of the testicle is reported.

7. A teratoma of the testicle with all metastases on the opposite side shows the irrationality of the radical operation, i.e., the routine removal of iliac and lumbar lymph nodes on the affected side.

J. Sydney Ritter, M.D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS

CONDITIONS OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Hitchcock, H. H.: Spondylolisthesis. Observations on Its Development, Progression, and Genesis. *J. Bone & Joint Surg.*, 1940, 22: 1.

Spondylolisthesis is a term now almost universally used to describe a forward displacement of the vertebral column consequent to a defect or solution of continuity in the interarticular portion of the neural arch of a vertebra,—a spondyloschisis or spondylolysis interarticularis.

The author presents 3 cases in which there was roentgenological proof of the progressive forward migration of the vertebral column. Development of the listhesis is accompanied by a dislocation of the related intervertebral disc, which undergoes progressive degeneration. The displaced disc may undergo calcification and eventual ossification and hinder further slipping by producing a buttress.

A comprehensive study of the genesis of the spondyloschisis (spondylolysis) and obervations on vertebral ossification are presented.

It is suggested that trauma during delivery or shortly afterward may be the cause of the defect.

DANIEL H. LEVINTHAL, M.D.

Wiberg, G.: Studies on Dysplastic Acetabula and Congenital Subluxation of the Hip Joint, with Special Reference to the Complication of Osteo-arthritis. *Acta chirurg. Scand.*, 1939, Vol. 83: Supp. 58.

This article is a comprehensive and detailed treatise on subluxation of the hip joint. The author first discusses the anatomy and roentgenographic appearance of a normal hip and then the historical background of the diagnosis and treatment of subluxation of the hip joint.

Wiberg carried on extensive investigations to determine a method of distinguishing between a normal and a maldeveloped acetabulum. He defines a dysplastic acetabulum as one in which the acetabular roof is faultily developed and does not allow a normal range of support to the femoral head. He believes that a normal hip joint requires that the head and acetabulum be spherical and the curvature of both correspond, and that if there is good contact between the acetabulum and the femoral head it is impossible for subluxation to occur.

He devised the following method of determining whether or not an adult hip is normal or maldeveloped. After a study of the normal hips of 100 subjects, he found that an angle which he called the "CE angle" varied in direct proportion to the degree of development of the joint. One side of this angle is formed by a vertical line through the femoral head and the other by a line from the center of the head through the lateral border of the acetabular roof

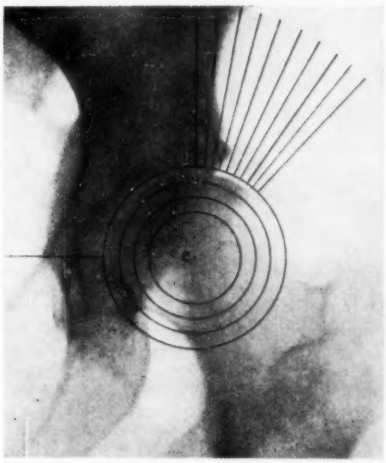


Fig. 1. Picture of a hip joint demonstrating the way the pattern is used. The two outside circles are parallel with the contour of the head. Line A goes through the center of the other head, and consequently line B lies parallel to the longitudinal axis of the body. E is the lateral edge of the acetabular roof, and the CE angle in this case is thus 14 degrees.

(Fig. 1). He concluded that angles between 20 and 25 degrees are borderline angles; smaller angles indicate defective development, and larger ones a normal acetabulum.

The importance of arthrography as a method of studying pathological hip joints is presented. The three requirements in the arthrographic picture of a normal joint are: (1) the tip of the limbus cartilage should be on a level with the line through the Y cartilage; (2) the cartilaginous acetabulum should embrace slightly more than half of the femoral head; and (3) there should be only a small band of contrast media between the head and the acetabular floor (Fig. 2).

The presence of sclerosis in the roof of the acetabulum is explained by the probable inferiority of the bone tissue. The author also points out that the smaller the weight-bearing surface of the acetabulum the greater the sclerosis, and the less the CE angle the greater the sclerosis, and *vice versa*.

According to Wiberg all patients with maldeveloped acetabula or subluxation of the hips develop osteo-arthritic changes, and 1 of every 4 cases of osteo-arthritis of the hip joint is directly attributable to subluxation. He states that the most serious complication of subluxation of the hips is osteo-arthritis, and early diagnosis and treatment should be carried out to prevent it.

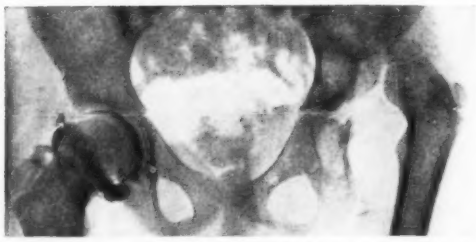


Fig. 2. Girl 5 years old. The right hip is normal despite the low limbus thorn (shown with arrow). The left is dislocated.

The signs and symptoms of subluxation of the hip are fatigue, pain, limp, difference in position of the skin fold on the inner side of the thigh, deviation of the vulva to the affected side, retarded development of the involved leg, and difficulty in abduction when the thigh is flexed. He mentions, however, that not infrequently there are no signs or symptoms.

The following methods of treatment are advocated:

1. In childhood and adolescence it is usually unnecessary to resort to operative treatment, the patient being protected from overwork, lifting, jumping, and strenuous exercise, and being encouraged to take frequent rest periods.

2. In the more serious condition the author recommends a shelf operation and keeping the leg in traction for eight weeks following surgery.

The author reports 25 cases, all of the patients having had pain, fatigue, and limp pre-operatively. Postoperatively, 7 had pain, 10 had limp, and 15 had fatigue.

He concludes by stating that the shelf operation in cases of subluxation of the hip will often preclude the development of osteo-arthritis.

FRANK E. STINCHFIELD, M.D.

Marottoli, O.: The Traumatic Nature of Osteochondritis Dissecans of the Knee Joint (Sobre la naturaleza traumática de la osteocondritis disecante de la rodilla). *An. de cirug.*, 1939, 5: 331.

The cause of osteochondritis dissecans, which very often affects the knee joint, remains an unsolved problem, though many works have been published on this subject.

Of the many theories proposed to explain it, only two have stood the test of time; they are: the theory of aseptic subchondral necrosis of the bone, and the theory of trauma. The first theory has been maintained especially by Axhausen, while the traumatic origin of the lesion has been proposed by Koenig, Barth, and Fairbank. The primary lesion of osteochondritis would be a partial fracture of the femoral condyle.

The following facts were enumerated by Fairbank in behalf of his theory:

1. Osteochondritis dissecans appears more often in young people, who indulge in violent sports.

2. After a trauma, in many cases of recent origin, the typical lesions can be shown by roentgenograms and during operations.

3. Lesions at the typical site, involving only the cartilage, always have previous trauma.

4. There is complete absence of any inflammatory change, macroscopic or microscopic, in or around the lesions.

5. The direct examination during an early operation suggests a simple recent fracture. When sufficient time has elapsed to show modifications, they consist only in what we would expect from the reparative effort of the organism. In cases in which the traumatic origin of the lesion could not be proved, similar changes were occasionally found in the more exposed parts of the femoral surface.

6. When a loose fragment is united to a vascular pedicle, the bone is not dead. One cannot, therefore, call it a sequestrum.

7. In order to explain the appearance of the lesion in both knees or in the joints of more than one member of a family, it is easier to accept the presence of anatomical peculiarities, which favor exceptional local trauma, than to suggest an embolic condition with circulatory changes.

The author has seen clinical cases in which the existence of trauma of a joint, without pathological history, has been proved at the operation. However, there are other facts which point against the traumatic theory and favor a multiple origin for the osteochondritis dissecans. Trauma cannot explain the bilateral cases of Wile, published in 1912, and, in some statistics, the absence of traumatic antecedents is very conspicuous.

The author publishes a new case in which the traumatic origin has been proved both in the origin of the lesion and at the operation. This operation was performed twenty days after the serious direct injury to the joint, and the foreign body found showed all the characteristics of normal osteocartilaginous tissue, as seen in a partial fracture.

Doubtless it is very difficult to explain how this part of the femoral condyle can be directly injured. Its situation makes a direct trauma in any position of the joint almost impossible. An explanation has been sought by study of the patella, the tibial spine, the tibial margin, or of rupture of the condylar insertion of the posterior crucial ligament.

Probably the mechanism is the indirect contusion caused by the patella, which is called an "impression fracture" by Roesner.

Marottoli remembers that, as shown by Lagomarsino, if the joint is flexed more than 90 degrees the patella covers a large surface of the medial condyle because of the lateral position of the latter, especially in joints which show a valgum deviation. Under these conditions a trauma can act directly on the condylar surface through the soft parts near the patella. When the knee is flexed only 45 degrees, a blow medial to the patellar tendon and under the apex of the patella can also injure this surface.

HECTOR MARINO, M.D.

Karlson, S.: Chondromalacia Patellæ. *Acta chirurg. Scand.*, 1939, 83: 347.

Chondromalacia patellæ is a disease consisting of degeneration of the cartilage on the patella. The knowledge of this condition is of rather recent date and the literature on the subject is meager. The author presents a review of re-examination findings in 62 cases which were operated upon and in 71 which were treated conservatively. The material for this report dates back to 1916 when the first operation was performed.

The origin and development of chondromalacia patellæ depend on an incongruity between the demands on the patellar cartilage and the resistance of the cartilage. Opinions differ as to whether this incongruity is dependent upon too high demands, as acute and chronic trauma, upon reduced resistance of the cartilage due to its being inferior, or upon a combination of these factors. The fact that acute trauma greatly influences the origin of chondromalacia is asserted by all writers on the subject. Buedinger had an opportunity of seeing a subchondral hematoma with fissures in the cartilage immediately following an acute trauma. The acute trauma would be the cause of the rupture of the cartilage which deprives the chondral surface of its quality as a firm smooth gliding surface. The chronic trauma which the articular function produces continues the destruction.

Aleman divides traumatic chondromalacia into three phases. The first phase is that of patellar contusion, the cartilage being fissured. The second is chondral malacia, the cartilage being raised and split by longitudinal and transversal fissures. The color of the cartilage is still normal, however, and the surface glossy. The patients are clinically or at least subjectively free from symptoms (latent chondromalacia). Finally, the third phase presents degenerative chondral changes and synovitis, the patient suffering severely (manifest chondromalacia).

The subdivision of chondromalacia patellæ into three phases in regard to symptoms and objective findings is recommended. The first of these phases, the rupture of the cartilage, does not belong to the true chondromalacia but to its origin. The symptoms are those of patellar contusion, but the suspicion of there being a rupture of the patellar cartilage is caused by the continuance of the trouble, the pressure-tenderness on the patella being especially prominent, and the difficulty in extension of the knee from an extreme flexed position. The troubles gradually disappear, however, and the patient enters the second phase of chondromalacia, latent chondromalacia.

In this phase the patients have no subjective symptoms or, if they experience any discomfort, it is so inconsiderable that they pay no attention to it. It is common to find rough crepitations under the patella, these crepitations being especially frequent in cases of exertion. They are caused by fissures being formed in parts of the patellar cartilage, those parts being raised and softer than the surroundings. The patient remains in this phase with practically no pains for a longer or shorter period, and, according to Aleman, he need never enter the third phase unless he exposes the joint to severe strain.

However, heavier exertions may cause the patient to have more and more trouble with his joint, and the case then changes to the third phase of chondromalacia with its partially typical symptoms.

These include the subjective symptoms with a feeling of stiffness in the knee, pains, "jamming," difficulties to support on the patella owing to a more or less painful feeling when the joint is flexed, weakness and an increased feeling of fatigue in the diseased leg, and audible or perceptible crepitations.

The objective symptoms are palpabie patellar crepitations, a thickening of the synovial membrane, pressure-tenderness, a swelling of the subpatellar fatty bodies, effusions in the joint, atrophy of the femoral muscles, and pressure-tenderness during support on the patella, the joint being flexed.

The "jamming" is a characteristic symptom. It appears when the limb is extended, as a momentary hitch, which immediately goes over with a snap, often quite painful. The "jammings" are not lockings and must be differentiated from them. The patients often conceive them to be sprains. Actual lockings are, however, not uncommon in chondromalacia patellæ, and the first symptom may sometimes be such a locking. The locking is caused by free bodies, broken loose from the surface of the patella. This was found in 6 patients.

The palpable crepitation, almost always present, is pathognomonic of chondromalacia under certain conditions. The crepitations typical of chondromalacia patellæ must be localized to the patella and have a hardness which resembles the sound produced when a rough chondral surface is moved across a chondral surface. In order to produce the crepitations and to obtain a correct conception of them, the knee joint is flexed and extended under different loads, i.e., the patella is made to slide across the facies patellaris femoris under different pressures. The crepitation may be medium-rough or fine, and sound like "volleys."

The thickening of the synovial membrane is at first localized to the vicinity of the patella.

It is difficult for the patient to support his weight on the patella of the involved side. This is done by having him kneel on a hard floor, draw up both feet under him, and support his toes against the floor.

The conservative therapy employed was bed rest, heat, and restricted activity. The operative treatment consists of removing all of the involved cartilage through a 10 cm. parapatellar or Payer's incision. That portion of the cartilage that is intact is not removed. This usually consists of a marginal seam. In 31 cases the whole surface of the cartilage was removed. The depth of the excision was down to sound tissue, that generally being the subchondral layer. In 1 case the excision was only of the facies patellaris femoris. Of the 65 knees operated on, there were 8 cases with a combined excision of the patellar cartilage and of the cartilage on the facies patellar femoris.

In cases in which marginal osteophytes occurred on the patella they were generally removed, this also being done in the case of osteophytes on the facies patellaris femoris. Pannus growing inward was removed. On the other hand, the synovial membrane was not excised. The synovitis has been found to disappear, too, after the diseased cartilage was removed.

The results in the operative cases have been encouraging. These cases have been subdivided into three groups, simple chondromalacia, chondromalacia plus arthritis deformans, and chondromalacia plus other injury to the joint. In the first group 23 of 36 patients, or 65 per cent, are subjectively recovered, 10 are benefited, and 3 are not benefited. Arthritis deformans developed in 7 cases. The changes are not very severe. In the second group 8 of 14 patients, about 57 per cent, are subjectively recovered, 3 are benefited, 1 is not benefited, and 2 are in a worse condition than before. Arthritis deformans, present prior to the operation, increased in 9 cases, remained the same in 1 case, and decreased in 4 cases. In the last 4 cases this was due to the fact that the excised osteophytes did not reform. In the third group, finally, 9 of 12 patients, or 75 per cent, are subjectively recovered. The 3 others were benefited. Arthritis deformans developed in 2 cases. In the non-operated cases, 10 patients of 71 are subjectively entirely free from complaints, 45 have slight trouble, and 16 severe trouble. The latter have experienced difficulties in performing their work. Arthritis deformans developed in 7 of 35 cases.

ROBERT P. MONTGOMERY, M.D.

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Gottesbueren, H.: The Treatment of Acute and Chronic Osteomyelitis in the Surgical Clinic of the University of Hamburg—Eppendorf (Die Behandlung der akuten und chronischen Osteomyelitis in der Chirurgischen Universitaetsklinik Hamburg—Eppendorf). *Muenchen. med. Wchnschr.*, 1939, 2: 1378.

Since 1930 there were 116 cases of osteomyelitis at the Surgical Clinic of the University of Hamburg, of which 68 were acute and 48 chronic. Of the 68 acute cases 53 occurred in males, and 15 in females. The second decade showed the greatest incidence, although 5 acute cases occurred in patients between sixty and seventy years of age. The long tubular bones were predominantly affected, the femur in 21 cases and the tibia in 18 cases. The disease was limited to one bone 42 times; to two bones 8 times; to three bones 5 times; and to four or more bones 3 times. The sources of infection were: furuncles in 10 cases; inflamed tonsils in 5; infected wounds in 3; felons in 2; and parametritis, septic abortion, cervical-gland abscess, and infected uterine cancer in 1 case each. In 15 cases, an injury, generally a blow, was given as the cause; nevertheless, trauma was accepted as the reason by the compensation board in only 2 of the cases. These injuries occurred two or three days earlier and only a relatively few hours had elapsed before the outbreak of the disease. Staphylococcus was the exciting agent. In 23 (one-third) of the patients, the blood cultures were positive; of these patients 7 died; of the group with negative blood cultures none died. The total mortality was 10 per cent; in septic cases, 30 per cent. The basic principle of treatment consists of employing the simplest and most gentle methods and immobilization. If a soft-tissue or subperiosteal abscess is found without indication of a medullary infection, the marrow cavity should not be opened. Premature opening may lead to infection of healthy medullary bone. However, if no soft-tissue or subperiosteal abscess is found, the marrow cavity is explored at a given site through small drill holes, and if definite infection is demonstrated, the bone is then chiseled wide open. If after drainage of a soft-tissue or subperiosteal abscess the general condition does not improve, the bone should be drilled or chiseled. Loose packing was inserted only in soft tissues. The Orr method was never used; the Loehr method was employed in mild cases, with a fenestrated rather than a circular cast. The latter permits no observation of the wound, and soon spreads a strong, unpleasant odor. The clinic believed that subperiosteal resection was indicated only in the clavicle and tibia. Indeed, in many cases resection may not be performed even in well persons; furthermore, sequestrum formation may not always be prevented, nor the development of pseudarthrosis. The clinic is very conservative with respect to diseases of the neck of the femur or pelvis with involvement of the hip joint. The femoral head was resected only once. These cases are treated by a small incision and irrigation. Moderate traction alone may suffice to overcome disease. In 3 cases dislocation resulted from muscular spasm in an extreme position of defense. A hip spica with mild traction was applied. Spontaneous fracture occurred in 4 cases of far advanced bone destruction and twice led to severe hemorrhage by blood-vessel erosion. In 2 cases the radial and peroneal nerves were damaged, following their involvement by the inflammatory process.

Recently, prontosil was prescribed 3 times daily; in empyema of the joint it was instilled into the joint and 10 per cent uliron gauze was applied. However, no decisive effect was noted. Therefore, a blood transfusion of from 250 to 400 c. cm. was employed with benefit and repeated several times after from forty-eight-hour to sixty-hour intervals. No special effect was noted from the use of staphylococcus serum.

Vinethene was employed for anesthesia because it works very quickly, does not irritate the air passages, is quickly eliminated, and only seldom is followed by nausea and vomiting. Nitrous oxide is also satisfactory. Intravenous anesthesias were avoided, particularly in the patients who were seriously ill.

Results. Thirty-two cases were healed by immobilization and simple incision alone. Sequestrectomy had to be performed in 29 cases. However, it was

necessary to wait for months before the process of sequestration was completed. Then either the Loehr method was employed or layers of muscle fascia were inserted, both with good results. The Loehr treatment was avoided whenever a mixed infection with anaerobes was found. Of 68 acute cases 50 were healed and 11 still had fistulas without demonstrable sequestra. These were sent to climatic spas and then operated upon after their return. The results in chronic osteomyelitis were worse, for these cases were treated after many preceding operations, in 1 case as many as 21. Of 48 patients, 18 had to be discharged with persistent fistulas; 27 were healed; 3 died, and 2 had amputations. Of the 3 deaths, 2 were from amyloidosis and 1 from sepsis despite amputation. Naturally, one is unable to predict recurrences in cases which at present are healed. A minor trauma may still reactivate a hidden latent focus even after thirty-five years.

(Franz). Jerome G. Finder, M.D.

Beekman, F., and Sullivan, J. E.: Blood-Borne Pyogenic Infections of Bones and Joints. *Ann. Surg.*, 1940, 111: 292.

The authors analyze 268 cases of hematogenous osteomyelitis, 218 "old cases" (treated prior to 1934), and 50 "new cases" (treated since 1934), from the children's surgical service of Bellevue Hospital, New York. Comparison is made between early and delayed surgery in the treatment of these cases.

Advocates of early operation appear to be of the opinion that the disease arises from within the bone and that all the systemic symptoms result from this focus; therefore, the earlier drainage is instituted, the better. Those who view the bone lesion as an incident in a general blood-stream infection believe that there is such a thing as a fixation abscess—nature's method of producing a defensive area from which the factors of immunity are organized and developed—and that the prognosis is improved by delay of the operation until the focus is reasonably well localized. The authors agree with the latter opinion and give statistics to support their conclusion.

Sixteen of 38 deaths in their "old series" occurred before the third postoperative day and 9 others before a week had elapsed. Thirty of the children had been sick for less than seven days before operation and all were markedly septic. Three died as early as twenty-four hours following the operation. Undoubtedly many of the patients would have died regardless of surgery because of the overwhelming intensity of the infection, but the results in the others, it was believed, might have been more favorable if surgery had been delayed at least until the resistance of the body had been strengthened through the establishment of a physiological fluid balance. Many patients with the fulminating type of infection in whom early operation was instituted died from early manifestations of septicemia, and in some of these operations disclosed that the infection had not yet become localized.

The course of acute hematogenous osteomyelitis differs materially in respect to the type of causative organism. The manifestations when due to the staphylococcus aureus are quite different from those due to the hemolytic streptococcus although both may produce a septicemia or pyemia accompanied by a local focus within the bone, the difference being due to the nature of the toxin of the staphylococcus and its ability to produce necrosis. The staphylococcus may also cause recurring attacks, while the streptococcus never does.

Since 1934 a more conservative method of treatment has been used. On admission of the patient to the hospital, a tentative diagnosis being made, the individual's general condition is built up through the administration of 5 per cent glucose and blood transfusions when indicated. If, however, a thin exudate has been obtained through aspiration, or the causative organism has been shown to be the streptococcus hemolyticus, operation is postponed, although a distended joint is always emptied of its effusion by aspiration before the limb is immobilized. Sulfanilamide is given when the streptococcus is found to be the causative organism.

Fifty cases in the authors "new series" are analyzed. The mortality in the old series when the infection was due to the staphylococcus was 16.5 per cent and when due to the streptococcus 17 per cent; while in the new series it was 10.3 per cent when due to the staphylococcus and 9.5 per cent when due to the streptococcus. When the blood culture was positive, the mortality in the old series was 46.5 per cent when due to the staphylococcus and 44.5 per cent when due to the streptococcus, while in the new series it was 27 per cent and 33.3 per cent respectively.

When death occurs in cases of hematogenous infection of the bones or joints, it appears to be due to either septicemia or pyemia, the result of the bacteremia, and not to the lesions within the bone or the joint. Hemic infections due to the streptococcus behave differently from those due to the staphylococcus, as shown by the manifestations of both the bacteriemia and the local lesion. In consequence, every attempt should be made to recognize the causative organism before treatment is begun. In the treatment of cases of hematogenous osteomyelitis and pyarthrosis, more attention should be paid to the general condition of the patient than has been done in the past and, before operation is undertaken upon the local lesion, the normal physiological fluid balance of the body should be established through the intravenous use of saline and glucose solutions and transfusions. The local lesion should not be drained by means of an incision until an abscess is formed or frank pus is found to be present, although in cases of pyarthrosis, the joint may be aspirated to relieve the tension within its capsule. Lesions due to the staphylococcus should be drained as soon as the patient's general condition warrants it. Those due to the streptococcus can be drained when a purulent exudate has formed. In the treatment of both acute

osteomyelitis and pyarthrosis, complete immobilization of the limb with infrequent dressings of the wound has proved of benefit.

F. HAROLD DOWNING, M.D.

Bade, H.: The Diagnosis, Differential Diagnosis, and Treatment of Ewing Sarcoma (Zur Diagnose, Differentialdiagnose und Therapie des Ewing-Sarkomes). *Fortschr. Roentgenstr.*, 1939, 59: 558.

In the years 1928 and 1929, Borak published the first work on Ewing sarcoma. The sharp differentiation of this growth by means of the reticulum cells of the bone marrow emanating from the tumor from bone sarcoma is, however, not generally accepted.

The author arrives at his conclusions from the study of 10 individual cases by means of diagnosis, differential diagnosis, and therapy of these tumors. Of the 10 patients, 7 were males and 3 females, the youngest being one and one-half years old and the oldest thirty-four years.

The most prominent or outstanding clinical symptom is pain, at first only occasionally, later becoming continuous. Frequently there also is fever, which may be very high. Sometimes simultaneously with the pain, sometimes later, there appears a swelling of the involved bones, above which the skin feels hot and sometimes edematous and sometimes the skin is traversed by engorged veins. In the blood picture, one often finds a leucocytosis. The diagnosis in most of the cases is determined by means of x-rays which show a spindle-shaped swelling of the bones in the tumor region beside a periosteal reaction which has the appearance of an onion or bulb. Through the widenings of the haversian canals, the bone has a spotted or stained appearance, but never goes on to sequestration. The long medullated bones and the diaphysis are most often affected. The (probe excision) biopsy is not entirely satisfactory as the tumor decomposes easily. The development in many cases takes place within a year, as in 2 cases of the author. The differential diagnosis is difficult and lies between syphilis, tuberculosis, bone cysts, and, especially, osteomyelitis.

For therapy, the author proposes the combination of irradiation and operation, but in spite of the great radiosensitivity of this tumor, the irradiation has had only poor results.

(A. BEYER). RICHARD J. BENNETT, JR., M.D.

Kirsch, R.: Bone Implants in Chronic Non-Tuberculous Arthritis (Die Spaneinpflanzung bei chronischen Arthritiden [ausser Tuberkulose]). *Ergebn. d. Chir. u. Orthop.*, 1939, 32: 227.

In view of the indefinite results of treatment of chronic, non-tuberculous arthritis and the satisfactory experiences resulting from the use of bone grafts in other diseases, this type of treatment was tried in cases of arthritis. Numerous examples of this treatment are already found scattered in the literature, but up to the present there is a lack of critical summary and evaluation of the method, a deficiency which the author purposes to remove.

Kirsch holds the concept of bone inlay to mean the implantation of any piece of bone whatever, regardless of whether it is transplanted freely or attached to a pedicle. Three different aims can be distinguished with reference to the implantation: (1) ankylosis of the affected joint, (2) mobilization of some biological force or other, and (3) the mechanical attainment of a new, firm support and, hence, the possibility of a better function from the strengthening of the edges of the articular cavity of the joint. These three aims are not strictly divisible, but rather complementary to one another. The implanted graft is effective not only by stiffening the joint, but also by its mere presence. Moreover, when joint function is prohibited, a change and transformation in the bone and cartilage of the adjacent portions of the joint take place. The purpose of elasticity of the healthy joint is served by its cartilaginous covering and its fine spongiosal structure, but this is altered as soon as the joint becomes diseased. In disease, we have in the roentgenogram, even after a short time, a more or less high-grade atrophy of bone, which becomes progressively greater in time. However, when the involved joint is brought to bony ankylosis by an inlay, its statics are completely altered, and the elastic demands upon the joint bodies vanish entirely. The result is that the uniformly fine mesh work of spongiosa regresses in the course of time and gives place to some compact buttresses, in which the graft becomes included, so that finally a statically and uniformly reconstructed whole is again established. Thus the disease process in the joint, otherwise aggravated by the continual stimulus of motion, is halted at its origin.

When holes are bored from the outer surface of the diaphysis through the epiphyseal line into the epiphysis and bone grafts are introduced into these, the forces having a biological influence on the affected joints and leading to cure are liberated, in spite of the fact that such intervention is extra-articular in execution. It is possible to show roentgenologically that regenerative processes appear in the arthritic joint portions soon after the operation. Acetabular rim reinforcements in chronic arthritis by means of implanted bone grafts are in fact made only in the case of the hip joint. The tendency to subluxation, which appears secondarily as well as primarily in the chronic arthritis is combated in this manner and the chief cause of pain is removed. Furthermore, the grafts act in a fashion similar to that of the supports already mentioned: analgesic, ossifying, and recalcifying.

The author has gathered accounts from the entire literature on bone inlays in chronic, non-tuberculous arthritis. In the case of the vertebral column, a graft was inserted in 26 instances for the purpose of ankylosis, in 20 cases successfully, in 1 with a poor result, and in 5 without any report of the result. If 19 cases of Kuemmell's disease are included in this series, good results were obtained in 18, only 1, in which the pain continued, resulting in failure. As the sacral joints are particularly affected by chronic

arthritic processes, the author considers them separately from the vertebral column for the purpose of graft inlays. He discovered 456 cases in the literature with cures or improvement in approximately 90 per cent, while there were true failures in 10 per cent. Graft implantations were carried out on the hip joint in 319 cases; 276 (86.5 per cent) of these were cured and only 43 (13.5 per cent) resulted in failure.

The operation is not to be performed when the process is bilateral, nor in extreme youth or advanced age. When pseudarthrosis has occasionally followed, it has been located at the point of transition from graft to trochanter major. The cause often lies in too short a bridge, but also in the fact that the trochanter is osteoporotic, cartilaginous, or still poor in calcium. Pseudarthroses do not heal spontaneously; fractures, on the other hand, heal in thirty or forty days with good immobilization. Drilling and buttressing of the femoral neck was undertaken in 38 cases, with success in 85 per cent. It seems immaterial to the operation whether the bone graft is removed from the tibia or the iliac crest, or even if dead bone is used. Warning is given against preoperative x-radiation. In the opinion of the author, the operation should always be attempted; if it is not successful, other therapy is always possible.

The utility of these procedures in many instances of chronic, non-tuberculous arthritis is attested by the striking results of acetabular rim reinforcements. Medullary implants were effective in 5 cases. The frequency of the use of bone implants in cases of arthritis of the joints mentioned forms a contrast to the infrequent use in arthritis of other joints: the knee, foot, and elbow. The author gives an account of 3 cases from Kappis' clinic. One was that of a coxitis of septic origin in a thirty-six-year-old man; a second, of a subacute coxitis which persistently resisted cure and a third, of an arthritis deformans caused by gonorrhea in a twenty-eight-year-old workwoman. The first patient died of generalized sepsis seven weeks following operation; the second acquired a postoperative suppurative parotitis[1] with metastatic suppuration of the hip after seven weeks, which resulted in the extrusion of the implanted span. In the third patient, a bridge taken from the tibial crest was inserted between the trochanter and the undersurface of the ilium; insufficient abduction due to adductor contraction required this procedure to be supplemented later by a subtrochanteric osteotomy. After almost seven and one-half years, the bone implant became fractured while the patient was walking on the street, but healed with strong callus formation.

From the results of his survey, the author concludes that the bone graft inlay in chronic, non-tuberculous arthritis deserves a much wider field of use than it has previously had. He considers that an attempt at its application is indicated in severe arthritis of every joint. Even when there may not be assurance of complete restoration of the individual's functional capacity, the probability is still so great at any time that the procedure becomes applicable to the majority of cases in the absence of better methods.

(Bode). O. Theodore Roberg, Jr., M.D.

Soeur, R.: The Treatment of Congenital Torticollis. *J. Bone & Joint Surg.*, 1940, 22: 35.

The author has used a bipolar-tenotomy technique for lengthening the sternocleidomastoid muscle in 40 cases of torticollis since 1933. A low subcutaneous tenotomy is combined with a high open tenotomy. The first 20 cases have been followed up for one year or more and are reported in a summary chart with additional comments on analysis. All were photographed before the operation and all except 1 were photographed one or more years later. When the pre-operative and postoperative photographs were compared, all cases showed excellent results as shown by the absence of a visible scar on the neck, perfectly straight head, and the shoulders at the same level. In patients under fourteen years of age, the treatment of congenital torticollis by bipolar tenotomy and immobilization in plaster in a position of hypercorrection for two months results in complete and permanent cure. In patients over fourteen years of age, correction of secondary deformities is not to be expected, but the improvement in the position of the head, neck, and shoulders is so striking that operation is definitely indicated.

The bipolar-tenotomy technique is advocated because it adequately corrects the contracture, effects a lengthening of the muscle at its attachments, and prevents formation of subsequent aponeurotic bands. The closed tenotomy is used at the clavicular or sternal sites to avoid the often occurring broad, hard keloid scars. The open tenotomy is used at the attachments of the sternocleidomastoid muscle onto the mastoid process and the occiput to assure complete division of these rather extensive attachments without injury to the facial nerve that emerges just anterior to the mastoid process. Each bundle of muscle tissue is elevated and severed under visual control. Local anesthesia is used whenever possible and the head piece and detached body portion of the cast are applied before the operation so as to reduce the operative risk to a minimum.

The helmet and jacket portions of the cast are joined together with plaster-of-Paris following the operation, with the head overcorrected by inclination to the well side and rotation of the face toward the involved side, with the neck in a neutral position regarding flexion or extension. The cast is worn for two months. The author believes that if immobilization is not maintained for a two-month period, the operation will result in failure. Adequate immobilization can be obtained only with a cast extending from the iliac crests to the top of the head. Only the eyes, nose, and mouth are visible and the chin portion of the cast is carefully molded. An incontestable advantage of prolonged immobilization is the fact that postoperative physical therapy is not required. None of the author's patients has received massage

or exercises nor has he worn Schanz collars or leather braces. There have been no cases in which a contracture of the opposite normal muscle developed. Atrophy and loss of function of the tenotomized muscle need not be feared because the operation lengthens the sternocleidomastoid muscle at its attachments and a fibrous callus or true tendon is formed at the musculotendinous sites.

Photographs of patients before and after operation and the author's method of completing the cast following the operation are presented.

ROBERT P. MONTGOMERY, M.D.

Smith-Petersen, M. N.: A New Approach to the Wrist Joint. *J. Bone & Joint Surg.*, 1940, 22: 122.

In arthrodesis of the wrist the aim is to produce a fusion of the radiocarpal joint in the optimum position of dorsiflexion and to preserve the motions of pronation and supination. This can be done through a medial incision and by resection of the distal end of the ulna.

The incision starts about 2 in. above the ulnar styloid, parallels the shaft of the ulna to a point just distal to the styloid, and then curves anteriorly in the direction of the proximal end of the fifth metacarpal. The distal portion of the incision runs parallel with this bone for approximately 1 in. After division of the subcutaneous fat and fascia, the ulnar periosteum is exposed and incised, and, by using care, a true subperiosteal exposure of the ulna can be obtained. Following an oblique osteotomy, the distal inch or more of the ulna is removed, which exposes the ulnar aspect of the radius. The periosteum, ligaments, and capsule are reflected from the radius and thus expose the radiocarpal joint. The capsule and ligaments are then reflected from the carpus. The increased mobility thus obtained facilitates the complete removal of the cartilage from the radius and carpus. With the hand in the optimum position of dorsiflexion, slots are cut in the radius and the carpus, into which a graft is placed. Usually the excised portion of the ulna, adaptively shaped, makes an efficient graft. The remaining fragments are packed around the volar aspect of the graft.

ROBERT P. MONTGOMERY, M.D.

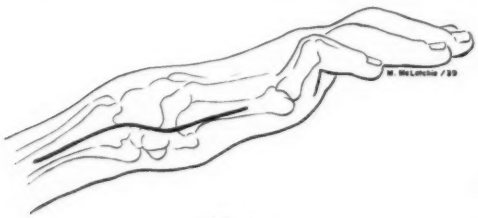


Fig. 1.

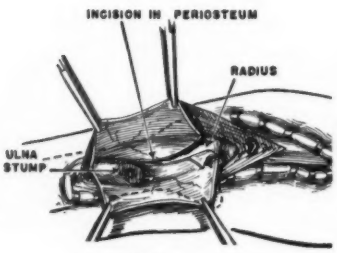


Fig. 2.

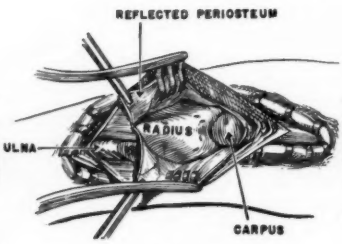


Fig. 3.

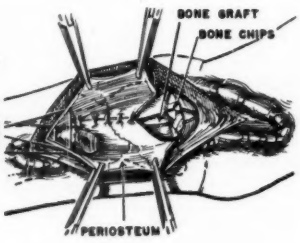


Fig. 4.

De Araujo, A.: A Contribution to the Surgical Treatment of Spondylolisthesis (Contribuiçao ao tratamento cirurgico da spondylolisthesis). *Rev. brasil. de orthop. e traumatol.*, 1939, 1: 83.

De Araujo accepts the presence of an initial stage of spondylolisthesis which is called "prespondylolisthesis" or "spondylolisthesis imminens": it is in this stage that the best therapeutic results can be obtained with surgical intervention. As prespondylolisthesis may cause lumbosacral pain and disturbances and can be cured only exceptionally by conservative orthopedic measures, surgical immobilization of the spine by means of arthrodesis is recommended: it will prevent displacement of the vertebral body, or spondylolisthesis, and cause rapid and complete disappearance of pain. He reports 3 cases of this initial stage in which he has performed paravertebral arthrodesis with a slight modification in the technique intended to prevent displacement of the osseous grafts.

The pre-operative preparation of the patient consists of rest in bed for one week in ventral decubitus on a pillow which lifts the upper part of the pelvis: this causes extension of the spine and consequent marked relief of pain. Spinal anesthesia is given the preference, but general anesthesia had to be employed in 1 case. The patient is placed in ventral decubitus with the upper part of the pelvis elevated. A curved incision with the concavity facing to the right is made from the spinal process of the third lumbar vertebra to the level of the second sacral vertebra, about 2 cm. from the median line. The flap is dissected as far as 2 cm. to the right of the spinal processes; the deep aponeurosis is incised ½ cm. from the middle line, and the muscular mass of the left side together with the periosteum is detached with an elevator, after which a hemostatic tampon is introduced. The same maneuver is repeated on the right side.

With the usual technique of Albee, an osteoperiosteal graft of adequate length is cut from the tibia and is divided longitudinally into two strong osteoperiosteal splints of sufficient thickness and rigidity to fix the spine. The tampon is extracted and the thorough removal of the vertebral periosteum is verified; then, an osteoperiosteal flap is lifted on the lamina of the third or fourth lumbar and the second sacral vertebræ to receive the extremities of the graft and keep it in place. The muscular and aponeurotic planes are reconstructed with interrupted heavy catgut sutures. The patient is kept for thirty days in the same decubitus as before the operation. This posture is so well supported that the patients prefer to keep it when allowed to change. No immobilizing apparatus was used when the patients began to walk, and results were excellent after three years in 1 case and two years in the remaining 2 cases.

RICHARD KEMEL, M.D.

Kuhlmann, F.: The Treatment of Inflammatory Ankylosis of the Vertebræ (Die Behandlung der entzuendlichen Wirbelsaeulenversteifung). *Therap. d. Gegenw.*, 1939, 80: 388.

Bechterew's disease has become more common in recent years because of improved diagnosis. The clinical picture is characterized by a complete ankylosis of the entire spine with all the resultant sequelæ. Severe pains are present at the onset of the disease. Generally, there is a mild leucocytosis with a moderate shift to the left and marked acceleration of the sedimentation time; in severe cases, secondary anemia may also be present. Roentgenograms of the spine reveal the characteristic picture of the "bamboo-stick," which results from hyperplasia and calcification or ossification of the ligament. The small vertebral articulations are disturbed, and narrowed; the joint borders are spread out; and the joint spaces decreased and eroded. Thus, according to Schmorl and Junghanns, the existence of Bechterew's disease is excluded if an open joint space remains. Trauma may be of etiological significance, if it should lead to an aggravation of a pre-existing lesion. Many observations indicate an inflammatory origin. Syphilis, gonorrhea, and tuberculosis are not of essential significance. Constitutional diathesis must be considered. Steffens proposes an endogenous or endocrine basis of Bechterew's disease. In any case, infectious foci of infection must be sought, and, if found, radically removed. The disappearance of profuse sweats after the eradication of foci, for example, in the form of dental root granulomas, must be considered in evaluating indications and results.

As in other inflammatory joint lesions, the significant relationship of bowel disturbances exists in Bechterew's disease also. On this basis excellent results have been attained by dietary management. The absorption of toxic products from an abnormal bowel in Bechterew's disease is indicated by a very high blood level of xanthoproteins and a frequently increased indican value in the urine. In these cases roentgen-ray investigations of the small intestine generally reveal a significant disturbance of motility or collections of gas; less frequently, changes in the bowel surfaces. According to the author's observations, sex-endocrine disturbances are of secondary importance and not to be considered as causative of the disease.

The treatment is, therefore, directed primarily against infections and toxic products in the bowel. Irrigation of the bowel, fast days, liquid-diet days, lactovegetable diets, and fruit diets are of value. Therefore, the aim should be to discover a diet which by treating the bowel condition shortens the course of illness and hastens the end of treatment. Toxins were likewise eliminated successfully. In addition, enriching the vitamin intake (B and C) is of great importance. Pyramidon, melubrin or novalgin are especially useful drugs. Benefit is derived from foreign protein therapy, for example, with solganal, novoprotin and paragen. Ultraviolet rays serve to improve the general condition of the patient; frequent short exposures are of greater value than exposures of longer duration. Roentgen and short-wave therapy also has a desirable effect, as have baths and other forms of application of heat (sandbaths, incandescent-lamp cabinets). Attention must be given to the prevention of deformity in the bedridden patient, especially of deformity of the spine. Locomotion is to be instituted only when the focal and enterotoxic damage has been overcome.

(MASKE.) JEROME G. FINDER, M.D.

Campbell, W. C.: Surgery of the Hip Joint from the Physiological Aspect. *Surgery*, 1940, 7: 167.

The head of the femur is supplied by capsular, periosteal, and interosseous vessels. In children the artery of the ligamentum teres, and in adults the posterior capsular artery, are the chief sources of blood supply. Conservation of the circulation is a major consideration in all hip-joint operations, and the capsule should always be incised at its junction with the acetabulum, or parallel with the neck of the femur. In children the capsule should not be incised in its inferior portion, and there should never be any unnecessary stripping of the soft tissue from the bone.

The Smith-Petersen incision is the best approach to the joint. When there is loss of support of the upper end of the femur either a new acetabulum must be formed by excavation, a reflection of a shelf of bone from the ilium must be provided, or a combination of both must be done. This is indicated in congenital and pathological hip dislocations and in ununited fractures of the femoral neck. Weight-bearing alignment may be restored by osteotomy below the trochanters or at the level of the ischial tuberosity.

The main feature in the treatment of Legg-Perthes-Calvé's disease is avoidance of weight bearing to protect the epiphysis from mechanical injury. With epiphyseal separation early reduction is important. If the case is seen late, an osteotomy with anatomical replacement is necessary to prevent later degenerative changes in the head and neck.

In fractures of the neck of the femur, if the blood supply to the head is poor, the head will retain the calcium present in it at the time of the fracture and will maintain a constant density. If the blood supply is adequate, the head will undergo atrophy similar to that of the surrounding bone. The circulation may be sufficient to prevent necrosis of the head and still not be good enough to produce callus. In fresh fractures of the neck, maintenance of the corrected position by some form of internal fixation is the most successful method of treatment. No weight bearing should be permitted for six months. In ununited fractures of the neck of the femur reconstruction operations are indicated in younger patients, and some form of osteotomy in the older ones.

Acute pyogenic infections of the hip joint are apt to distend and weaken the capsule and produce dislocations in children. Such dislocations should be immediately reduced and the joint drained. In adults dislocation results only when there is extensive destruction of the acetabulum or head.

Chronic osteo-arthritis of the hip joint may be treated surgically by any one of 4 procedures.

1. Excision of osteophytes from the head of the femur, which is seldom satisfactory; excision of the anterior wall of the acetabulum is much better.
2. Reconstruction by excision of the head and neck, which usually results in fair motion but poor endurance.
3. Subtrochanteric osteotomy, which eliminates contact of the osteophytes at the joint margins by rotation of the head.
4. Fusion of the joint, which is not easy to obtain, but is most satisfactory if there is free motion of the spine.

The article is opened by a discussion of essential factors in anatomy, embryology, bone structure, and circulation. CHESTER C. GUY, M.D.

Kager, H.: The Symptoms and Diagnosis of Tears of the Achilles Tendon (Zur Klinik und Diagnostik des Achillessehnenrisses). *Chirurg*, 1939, 11: 691.

Tears of the Achilles tendon are due to improper timing of force, training conditions, and demands made upon the tendon. The delicate band-like tendon of the plantaris muscle was found uninjured in the majority of the cases examined. Its function primarily is to tense the Achilles tendon. The tear may result from the failure of the muscle and an insufficient tensing of the Achilles tendon, as may occur in older people who are tired and without sufficient training, and then attempt sport activities. In tears of the Achilles tendon usually a sudden severe pain, as if a whip had hit it, is experienced in the muscle and this prevents further running. The foot cannot be lifted from the ground. The gait is stamping and limping, and walking down stairs and standing on the toes are difficult. Straightening out after slight flexion of the knee joint as in preparation for a jump is incomplete or impossible. With this injury there is missing the tense, slightly curved outline of the skin, and the profile of the tendon of the leg is distinctly different from that of the other leg. One can feel a gap in the tendon or a painful thickening due to hemorrhage beneath the skin, and in older cases scarring or cyst formation within the body of the tendon. These signs may be absent or may be covered over. At times there may be only partial laceration of the tendon with multiple smaller lacerations of the fibers at the musculotendinous junction, or there may be a rupture only of the tendon center, of the middle bundle, which alone carries the weight of the body over the ball of the foot.

Roentgenograms are valuable aids in the diagnosis. Under normal conditions the tendon makes a definite shadow of the soft parts; with the other deep tendons lying near the tibia it makes a definitely outlined triangular shadow. The point of this triangle is directed upward. In cases in which the tendon is torn this slender triangular shadow has disappeared. In comparing the injured side with the healthy side the diagnosis is made easily. It can be seen whether the tendinous portion of the calf has the proper tenseness or not, but regarding the site or the severity of the injury nothing definite can be gleaned. The treatment can be only operative.

Between 1936 and 1938, 38 patients were admitted on account of symptoms of old lacerations of the Achilles tendon. Thirty of these had been treated conservatively for a long time. Only in 25 per cent of the cases was a proper diagnosis made. The surgical treatment was carried out according to the following method:

The entire tendon was exposed without constriction and was split in the midline from the os calcis to the muscular attachment. At the point of laceration, now clearly visible, the bloody discolored, scarred, or cystically changed portion was completely excised. The resulting defect of the central tendon bundle was bridged over with a previously stretched strong silk suture. This was doubled and brought through the tendinous attachment on the periosteum of the os calcis. Then it was brought upward into the musculotendinous portion, fastened there, and tied under natural tenseness in the median position of the foot within the central part of the tendon. Then over this suture the lateral halves of the tendon were brought together and carefully sutured so that the strong silk suture was completely surrounded by tendon. Then a pedicled fascial graft was taken from the covering of the muscle and brought down over the tendon and fixed with light catgut sutures loosely. After all bleeding was stopped and the skin closed a cast was applied from the pelvis to the foot, the foot in drop-foot position and the knee slightly flexed. A window was cut in over the suture line. This cast was left on for three weeks.

Thirty-four cases so treated healed perfectly; the 4 others had minor stitch infections, but all of the patients are able to work and engage in sports actively. The operation insures complete restoration

in anatomical and functional respects. Physical therapy is employed.

(Bode). Leo A. Juhnke, M.D.

FRACTURES AND DISCLOCATIONS

Hall, R. D. McK.: Clay-Shoveler's Fracture. *J. Bone & Joint Surg.*, 1940, 22: 63.

In Western Australia, the term "clay-shoveler's fracture" has been applied to a fracture of one or more spinous processes of the lower cervical or upper thoracic vertebræ, occurring in the great majority of cases in relief workers engaged in shoveling clay. It is only since 1933 that this fracture has become a clinical entity and has been given its distinctive name, which implies that it is an occupational injury. The history is the same in most cases: the laborer throws up a shovelful of clay; the clay sticks to the shovel; the worker then feels a sudden stab of pain and sometimes hears a crack between the shoulders and is unable to continue working. A similar fracture occurs occasionally in laborers employed in other occupations, as in those shoveling other materials when the shovel is suddenly stopped by a hidden obstruction, or in those who are tree grubbing when the expected resistance to the blow is missing and they suddenly jerk on a resisting object. The site of fracture is most commonly the spinous process of the seventh cervical vertebra but the fracture sites ranged from the sixth cervical to the third thoracic vertebra in the 13 cases published in this article. The author has had 2 additional cases since the article was published.

Direct muscle violence, reflex muscle contraction and a whip-like pull transmitted through the supraspinal ligaments are three possible mechanisms by which these fractures occur. The fractures occur at the weakest point in the spinous process, which is the narrowest portion and is from ½ to ¾ in. from the tip. The expanded tips of the spinous processes distal to the narrow portions give origin to the thoracoscapular and costovertebral muscles and to the supraspinal and interspinal ligaments. The origins of the thoracoscapular muscles, particularly, appear to afford an explanation both of the localization of the lesion to the region between the sixth cervical and the third thoracic vertebræ and of the direction of displacement of the distal fragments. Since in general, the symptoms are unilateral and the signs implicate muscle fibers to one side of the spinous process only, the theory that these fractures result from direct muscle violence is the most probable etiological mechanism.

The patient usually complains of pain between the shoulder, nearly always to one side of the midline and sometimes beneath one scapula. The pain is worse on forward stretching of the arms, on an attempt to pull or to lift anything, or on the performance of any action which would produce a passive movement of the scapula away from the midline or an active one toward it. Sometimes the pain goes up to the head or down the spine; occasionally it attacks both the head and the spine and in some instances it proceeds down the arm, which invariably feels weak. Frequently the patient hears a click on performing certain movements and in old cases aching before wet weather is often noted.

Fig. 1. Showing typical displacement.

Examination reveals tenderness of the spinous process at the site of fracture, and tenderness along the course of the rhomboideus muscle on one side can always be found if looked for. Mobility of the affected spinous process can usually be detected. Pain and tenderness do not as a rule spread across the midline. Pain on active contraction or passive stretching of the rhomboideus or the trapezius muscle is invariable. Somtimes crepitus or clicking can be demonstrated either by the examiner or by the performance of certain movements on the part of the patient. Flexion of the head invariably produces pain.

The majority of the cases are erroneously diagnosed as "muscle strain" and are treated conservatively for several months and this delay, in the author's opinion, considerably decreases the chances for a complete recovery. The treatment indicated is early removal of the detached fragments. Late removal is not so successful, for the reason that the patient, having made no progress under the treatment instituted, loses confidence when informed that he has a fracture which has not united and that the loose fragment will have to be removed by operation. He then rapidly develops the idea that he has not been properly treated and will not return

to work until he has been completely cured. The failure is, the author believes, more mental than physical.

Thirteen case histories and roentgenograms are presented. ROBERT P. MONTGOMERY, M.D.

Joos, H.: End-Results in 284 Fractures of the Femoral Shaft at the Freiburg University Surgical Clinic for the Years from 1928 to 1935 (Ueber die Heilungsergebnisse von 284 Oberschenkel-Schaftfrakturen der Freiburger Chirurgischen Universitaets-Klinik in den Jahren 1928–1935). Freiburg i. Br.: Dissertation, 1938.

The upper femur is most abundant in musculature, and the muscles, bone, and periosteum combine in definite unity for the healing of fractures. According to the investigations of Rahn, the muscles lapse for about eight days into a static condition, which is then relieved by a state of increased muscular activity—a physiological intermittent tetany. This naturally varies in severe contusions. The region from the metaphysis to the lower third of the femoral shaft is free of muscle attachments. On this account callus formation is poor in this area and, in addition, everything is influenced by the pull of the gastrocnemius muscle.

The results of fracture at the different clinics vary greatly. Of 284 cases only 188 could be observed for an average of two years; of these 13 or 6.5 per cent were complicated fractures. The causes for amputation were: 3 severely comminuted fractures (first day); 1 gangrene after rupture of the popliteal artery (fourth day); 1 infection (ninth day); 1 infection after an autogenous bone graft (after twenty weeks); and 1 gangrenous ulceration of the leg (fourteenth day). Among the causes of death were 6 cases of fat embolism (from the first to fourth days); 2 cases of pulmonary embolism; 8 cases of bronchopneumonia or circulatory collapse; 2 cases of infection; 2 cases of multiple fracture; and 4 cases of skull fracture. If the last 6 cases are deducted, then death due to femoral fractures alone occurred in 18 or 6.3 per cent of the cases.

In designating the results, "very good" indicated shortening of 1 cm. or less with complete range of joint motion; "satisfactory" meant healing with moderate limitation of abduction in the hip joint (from 5 to 10 degrees), or a diminution of knee flexion up to 60 degrees, or a shortening up to 2 cm. All other results were considered "poor."

Closed reduction.

A. Reduction. Thirty-eight cases (25 adults and 13 children) were reduced in plaster casts.

The hospitalization for adults was eleven weeks and for children nine weeks.

Type of fracture	Transverse	Oblique or spiral	Comminuted
Subtrochanteric	..	14	.
Upper third	2	2	1
Middle third	7	5	1
Supracondylar	1	2	3
	10	23	5

Results	Very good (per cent)	Satisfactory (per cent)	Poor (per cent)
Adults	44	40	16
Children	85	7.5	7.5

B. Traction with plaster casts. Fifty cases (17 adults and 33 children from one to five years of age) were treated by this method. The tendency toward retraction was always greater in adults. Infants were treated by Schede's modification of the Wahl method.

The hospitalization for adults was twelve weeks and for children eight weeks.

Type of fracture	Transverse	Oblique or spiral	Comminuted
Subtrochanteric	..	10	2
Upper third	3	5	1
Middle third	10	13	2
Supracondylar	2	2	.
	15	30	5

Results	Very good (per cent)	Satisfactory (per cent)	Poor (per cent)
Adults	31	31	38
Children	93	7	..

C. Prolonged traction. In the management of transverse fractures reduction was accomplished on a fracture table after insertion of a Kirschner wire through the condyles and with incorporation of the wire into the cast. Forty-one cases (only a few children) were observed.

The hospitalization for adults was twelve and one-half weeks and for children nine weeks. There were 2 cases of infection about the wires, one resulting in ankylosis of the knee joint, the other in sinus-tract formation. However, the methods used did not always afford good reductions; in 12 cases, therefore, it was necessary to resort to surgery.

Type of fracture	Transverse	Oblique or spiral	Comminuted
Subtrochanteric	..	3	1
Upper third	5	1	1
Middle third	17	6	2
Supracondylar	3	1	1
	25	11	5

Results	Very good (per cent)	Satisfactory (per cent)	Poor (per cent)
Adults	53	15.5	31.5
Children	100	....	....

Open reduction. As a rule, operation was not performed before the tenth to twentieth day. However, according to the investigations of Lexer early surgery is not harmful and indeed may be an advantage in so far as the reduction is easier. On this account 22 (39 per cent) of the operations were done during the first three days; 30 (53 per cent) were done in the course of the second week; and 5 (8 per cent) were done after the twelfth week. This made a total of 57 cases. The surgical attack is indicated in severely dislocated oblique and spiral fractures.

In these cases the operator employed a double ring of steel wire (Krupp); in young children with transverse fractures a steel plate was used; in transverse fractures or bony defects in adults an autogenous splinting was obtained by use of a heavy tibial graft; this was varied by encircling with a metal band or by dovetailing, as well as by simple wiring and a Lane plate.

A. Open reduction with double wire rings was done 35 times, on 18 adults and 17 children.

The hospitalization was thirteen and one-half weeks for adults and eleven and one-half weeks for children.

Type of fracture	Oblique or spiral	Comminuted
Subtrochanter	3	..
Upper third	4	..
Middle third	17	1
Lower third	6	..
Supracondylar	4	..
	34	1

Results	Very good (per cent)	Satisfactory (per cent)	Poor (per cent)
Adults	45	22	33
Children	83	11	6

B. Nine cases were treated by the use of encircling steel bands.

C. There were 7 cases treated by splinting with rustless metal which was followed by circular wiring; of 6 children so treated 4 had very good and 2 had satisfactory results.

In 22 per cent of the cases there was an average shortening of 1.85 cm. The amount of shortening in the other 78 per cent was not given; this might have been of great interest. In 22 adults with transverse fractures in bad position, tibial grafts were employed. Bony union was attained in 19 cases. The author states that grafting is a very worth-while procedure as these results could not have been obtained by conservative measures. Amputation was done in 1 case of postoperative infection.

(Franz). Jerome G. Finder, M.D.

SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD VESSELS

Baccaglini, G., and Ballarin, G.: Aortography with Contrast Substances (L'aortografia con mezzi di contrasto). *Radiol. med.*, 1940, 27: 1.

Baccaglini and Ballarin made two series of experiments on dogs. In the first, they studied the cardiovascular and respiratory disturbances which may follow endaortic injections of contrast substances used in aortography. The dogs were anesthetized and the substances were injected at various levels of the aorta in the dose and concentration and at the speed necessary to obtain aortography, while the carotid pulse and the respiration were registered at the same time. The injections were given through a semi-rigid sound introduced into the aorta from the femoral artery, according to the method of Oselladore, and the apparatus of Dos Santos-Gentile was used to obtain a constant speed of injection. Control experiments were made with physiological serum and sodium-chloride solution of molecular concentration near that of the opaque solutions injected into the aorta, and with the same solutions or with the contrast substances into the venous circulation. In the second series of experiments, macroscopic and microscopic examinations were made to determine whether any changes occurred in the internal organs at various periods after the endaortic injection of opaque substances; the control experiments were similar to those used in the first series.

A temporary fall in the blood pressure corresponding especially to the molecular concentration of the solutions used was observed after endaortic injections in the first group of experiments; it was absent after injections of physiological serum, slight after injections of organic compounds of iodine, strong after injections of high concentrations of sodium iodide, and still more marked after injections of saturated solutions of sodium chloride. The pressure under which the solutions were injected into the aorta did not influence the pulse or the respiration. However, the molecular concentration of the solutions does not play a fundamental part in the production of the cardiovascular and respiratory changes; in reality, the changes are related to the chemical nature of the substances used, sodium iodide being the worst offender. The changes are probably due in part to local stimulation of the aortic system, in part to sympathetic stimulation by the suprarenal glands, which show congestion, and perhaps also to a central nervous action as suggested by a lesion of the medulla. The anatomicopathological investigations show that high concentrations of sodium iodide injected into the aorta are capable of causing lesions of the internal organs; necropsy shortly after the injection reveals marked congestion, especially of the liver, kidneys, and suprarenal glands, while histological examination always shows more or less degeneration of the kidneys and suprarenal glands. Persistent paraplegia appears regularly in surviving animals. Even uroselectan causes temporary paraplegia in some cases, but it does not determine appreciable changes in the internal organs, and no animals have died from its injection. Injection of opaque substances into the vein did not cause any lesions in the internal organs.

At present, aortography is still an open problem which may be solved by the discovery of a substance having sufficient opacity and insufficient toxicity to compromise the integrity and the functions of the organs with which it comes in contact in high concentrations. An important point to remember in the solution of the problem is that Dos Santos has claimed that the aortic route is less dangerous than the intravenous, because the substances introduced into the aorta pass through the capillary system before reaching the general circulation and are in great part retained by the tissues, which later deliver them slowly to the general circulation. If this is accepted, it is evident that the substances will exercise their action on the tissues irrigated by the aorta in higher concentration than that which would be present after introduction of the same dose with the same speed into the vein, and therefore the theory of Dos Santos cannot be accepted without reservations. The fact that aortography with uroselectan may cause paraplegia in dogs is the best proof of this.

RICHARD KEMEL, M.D.

Pereira, S., Rodrigues, A., and Carvalho, R.: The Collateral Circulation of the Extremities; An Experimental Study (Circulation collatérale des membres; étude expérimentale). *Presse méd.*, Par., 1939, 47: 1545.

The authors studied experimentally in dogs the comparative values of several methods of developing the collateral circulation in the extremities after segmental obliteration of the main artery of the limb. Arteriography was used to determine the arterial vascular change.

Lumbar sympathectomy caused the greatest development of the collateral circulation of the limbs. Lumbar infiltration with novocaine was followed by an equal increase in the collateral circulation on the infiltrated side. At first this circulation was as well developed as after lumbar sympathectomy, but later the sympathectomy developed the best collateral circulation. The intra-arterial injection of novocaine in some instances caused a slight increase in the collateral circulation on the injected side. However, in a large number of cases there was no difference between the collateral circulation of the side injected with novocaine and that of the normal limb. The unilateral resection of the splanchnic nerves showed

no increase in the collateral circulation on the operated side. FREDERIC W. ILFELD, M.D.

Leriche, R.: Disturbances Resulting from Ligatures (Les maladies des ligaturés). *Presse méd.*, Par., 1940, 48: 41.

Leriche states that the circulatory disturbances that result from the ligature of an artery are not due primarily to a deficient supply of blood but to interference with the normal physiology of the arterial wall. A ligature traumatizes the artery; this causes a disturbance of the vasomotor system, and results in a vasoconstriction in the collateral circulation. This can be relieved by sympathectomy or infiltration of the regional sympathetic nerve with an anesthetic as well as by arteriectomy. This vasoconstriction in the collateral circulation plays an important part in the production of the ischemia and possible gangrene resulting from the ligature. A ligature, therefore, not only results in a mechanical obstruction in the artery ligatured, but also causes an injury to the arterial wall which results in interference in the function of the collateral circulation through its vasomotor effects.

The various types of "ligature disease" noted by the author are: (1) massive gangrene which occurs when the circulation is not re-established at all in the area supplied by the ligatured artery and its collaterals; (2) partial gangrene occurring in certain areas where the circulation is not completely re-established, this depending upon the extent of the injury to the artery, and the degree of thrombosis and of spasm in the arterial circulation; (3) ischemic sclerosis without necrosis of tissue, developing when the re-establishment of the circulation does not supply sufficient blood to the tissues involved, with secondary sclerosis of the connective tissue which may result in injury to nerves and muscles and "ischemic paralysis"; (4) claudication, pain, and circulatory and trophic disturbances, which occur when the circulation has apparently been re-established, but the blood supply is not sufficient under certain circumstances. Thus, in intermittent claudication the blood supply is sufficient for the muscles at rest, but not sufficient for muscular work. The other symptoms depend upon the vasomotor disturbance and the reflex contraction of the collateral arteries with consequent venous stasis and cyanosis.

The best method of avoiding "ligature disease" is to avoid the use of ligatures and to use sutures instead. However, in certain conditions, and especially in war wounds, this is not always possible. In such cases, the procedure used must be such as to suppress the vasoconstrictor reflex—section of the artery between two ligatures, limited resection of the artery, regional periarterial sympathectomy, or infiltration or section of the regional sympathetic nerve. By such methods vasodilatation may be obtained in the collateral circulation and the circulation thus satisfactorily re-established. If the integrity of the tissues is to be maintained, infiltration of the sympathetic nerve must be done immediately; and infiltration should be repeated as often as necessary to prevent vasoconstriction and arterial spasm. If symptoms other than gangrene have developed after ligature of an artery, extensive amputation is not necessary. If there is limited muscular necrosis, some orthopedic operation may be necessary, as, for instance, hemi-astragalectomy, in one of the author's cases. For the relief of pain and vasomotor and trophic symptoms, the ideal procedure it to resect the ligated and thrombosed segment of the artery and repair by graft, but Leriche has found that this is rarely possible; the loss of tissue may be too great or the adjacent tissues too sclerotic. Earlier operation may make it possible to carry out this procedure more frequently. When this is not possible, regional sympathectomy is indicated. ALICE M. MEYERS.

McKittrick, L. S.: Diabetic Gangrene: A Review of 972 Cases of Gangrene Associated with Diabetes Mellitus Treated at the New England Deaconess Hospital. *Arch. Surg.*, 1940, 40: 352.

Nine hundred and seventy-two cases of obliterative vascular disease in patients with diabetes mellitus are reviewed. The mortality in the hospital was 9.4 per cent. Of patients treated without operation 4.6 per cent died and the mortality after major amputation was 13.9 per cent. The average age of the patients was sixty-four and three-tenths years and the average duration of the diabetes was eight and seven-tenths years. The sex distribution was about equal. In 73 fatal cases infection and cardiorenal disease were equally common as the causes of death and pulmonary disease was next in frequency.

Except in selected cases supracondylar amputation is considered the safest operation and is followed by the shortest and easiest convalescence. In 112 consecutive primary supracondylar amputations comparative studies with the use of silk and catgut indicated that neither suture material held any merit over the other provided that the suture used was only large enough to allow careful approximation of the fascia. Bilateral amputations were done in 70 patients. The average interval between discharge from the hospital and the onset of gangrene in the other leg was twenty-five and three-tenths months.

Of 33 patients who refused amputation and, therefore, left the hospital, 11 survived later operation and 20 died of progressive gangrene or after amputation elsewhere; one had slow healing but could never walk on his foot; another patient died four years later of coronary occlusion. The hospital organization for the care of diabetics with gangrene is described. WALTER H. NADLER, M.D.

Murray, G.: Heparin in the Surgical Treatment of Blood Vessels. *Arch. Surg.*, 1940, 40: 307.

Heparin was discovered by Howell in 1916, who showed it to be an anticoagulant. Further purification was carried out by Best and by Charles and

Scott. Experiments by Murray demonstrated that it would prevent thrombosis.

The purified form of heparin has been shown to be non-toxic to animals. In many operations on veins and arteries it has been shown to prevent thrombosis and clotting until healing has taken place. Venous grafts in arteries have been kept patent by its use and have functioned satisfactorily, for one and one-half years.

In 440 patients in the hospital treated with heparin, thrombosis and embolism did not occur. Patients with thrombophlebitis were thought to be benefited by the treatment. Striking improvement was observed in a group of cases of pulmonary embolism; with 1 possible but unproved exception, none of the patients had further embolisms, and none died of pulmonary embolism. Embolectomies were successful in 12 cases when heparin was used. In 1 case a venous graft was placed in an artery; this remained patent and functioned satisfactorily. It is suggested that heparin is a most important agent for the prevention of thrombosis when operation for the repair of blood vessels is undertaken. It might also be used to advantage for diseases in which thrombosis and clotting in the blood vessels occur.

PAUL MERRELL, M.D.

Herrmann, L. G., and McGrath, E. J.: The Effect of Estrogens on Vascular Spasm Due to Active Angiitis in the Extremities. *Arch. Surg.*, 1940, 40: 334.

Sixteen patients, 13 male and 3 female, with arterial insufficiency due to secondary vasomotor instability associated with active arteritis or phlebitis were examined and then treated by the parenteral administration of moderate quantities of estrogen (estrone or theelin) at regular intervals for at least four months. The final decision as to the condition of the patients was based on the results of objective studies of the efficiency of the peripheral vascular system and on an appraisal of subjective effects. Eleven patients showed definite improvement; signs of vasomotor instability in the digits became less marked and there was a corresponding decrease in pain. Symptoms recurred in 3 patients after two years of relief. In 4 patients the symptoms were not relieved and in 1 patient they became worse while under treatment. WALTER H. NADLER, M.D.

Ochsner, A., and DeBakey, M.: The Therapy of Phlebothrombosis and Thrombophlebitis. *Arch. Surg.*, 1940, 40: 208.

The authors differentiate between thrombophlebitis and phlebothrombosis. In the former, the intravascular clotting is associated with and dependent on inflammation of the wall of the vein, whereas, in the latter, there is no associated inflammatory process. Because of the last and with absence of fixation of the thrombus to the vessel wall, there is great danger of embolism.

The therapy of thrombophlebitis is reviewed, and is classified into prophylactic, conservative, and radical measures. The prophylactic measures consist of hydration, mobilization, respiratory stimulation, the prevention of increased abdominal tension, the application of heat, the administration of sodium thiosulfate, hirudinization, and heparinization. The conservative measures consist of immobilization and elevation of the involved extremity, the application of heat, hirudinization, the application of compression bandages, and vasodilatation.

In the experience of the authors, the best therapeutic measure is procaine-hydrochloride block of the regional sympathetic nerves. The rationale of this therapeutic measure is discussed, and the excellent results obtained from its employment in 22 cases are described. The authors have shown by clinical and experimental observations that vasospasm resulting from impulses originating from involved venous segments is one of the most important factors in the production of clinical manifestations of thrombophlebitis. Such vasospastic influences probably affect both the arterioles and the veins. A localized thrombophlebitic process can initiate a marked vasospasm. The vasospasm may be so marked that the condition appears to be arterial embolism, and in some instances actual gangrene has occurred. Experiments on animals have shown convincingly that localized chemical endophlebitis may produce such marked arteriolar vasospasm that practically all pulsation disappears. Moreover, it is possible to demonstrate that this mechanism is the result of vasoconstrictor impulses originating in the involved segment and transmitted over the sympathetic nervous system. The technique of sympathetic block, as used by the authors, is briefly described and illustrated.

The radical procedures consist of ligation, excision, incision and drainage, and thrombectomy or embolectomy. HERBERT F. THURSTON, M.D.

Theis, F. V., and Freeland, M. R.: Thrombo-Angiitis Obliterans: Treatment with Sodium Tetrathionate and Sodium Thiosulfate. *Arch. Surg.*, 1940, 40: 190.

The authors observe that thrombo-angiitis obliterans is a clinical and pathological entity characterized by peripheral arterial thromboses of obscure origin. On the basis of investigative work, they have concluded that thrombo-angiitis obliterans in the majority of cases is associated with the following factors: (1) changes in the blood; (2) disturbed tissue metabolism; (3) arterial and venous thromboses, which occur most frequently in the peripheral vessels but may occur in any part of the body; and (4) local infection in the involved extremity. Until the complex adjustments which compensate for pathological conditions of the blood are better understood, it will be difficult to detect the disease before serious circulatory deficiency results from arterial thrombosis. Infection, infarcts, or gangrene frequently direct attention to the circulatory disease.

The authors directed the treatment of their cases of thrombo-angiitis obliterans toward improvement

of the condition of the blood. The following facts seem pertinent: (1) pathological changes in the blood are present during the acute stage of the disease; (2) clinically, smoking is associated with an acute attack of the disease, and heavy smoking may contribute to the changes in the blood; (3) sodium tetrathionate and sodium thiosulfate are of clinical value in the treatment of the disease.

Sodium tetrathionate and sodium thiosulfate injected intravenously may produce a marked increase in the oxygen capacity and content of the circulating blood in some patients. This was most marked in patients with active thrombo-angiitis obliterans and dark, thick blood; no significant increase in the erythrocyte count or value for hemoglobin accompanied the change. The presence of an inactive form of oxyhemoglobin seemed most likely to account for this effect. In accounting for the marked increase in oxygen capacity and content of the blood of some patients after the injection of inorganic sulfur, all evidence seemed to corroborate the findings that a catalytic action was produced by the injected chemical.

Sodium tetrathionate had a less immediate but more prolonged effect than sodium thiosulfate. The more rapid oxidation and excretion of the thiosulfate as free sulfate in the urine may account for this difference.

In conclusion, the authors observe that intravenous injections of sodium tetrathionate and sodium thiosulfate were usually followed by an increased peripheral temperature, a decreased pulse rate, and reduction in the blood pressure. These physiological responses were associated with changes in the oxygen capacity and in the oxygen saturation of the arterial and the venous blood.

These effects were in contrast to those that occurred with smoking, which is an important causative factor in thrombo-angiitis obliterans. The therapeutic value of sodium thiosulfate and sodium tetrathionate is probably due to the changes produced in the blood and the resulting physiological responses.

HERBERT F. THURSTON, M.D.

Wright, I.: Conservative Treatment of Occlusive Arterial Disease. *Arch. Surg.*, 1940, 40: 163.

In this report an attempt has been made by the author to review and evaluate the more important of the methods used in the conservative treatment of occlusive peripheral vascular disease, especially arteriosclerosis obliterans and thrombo-angiitis obliterans. The more general use of the conservative approach definitely affects the statistics on amputations. It should be recognized that it is far better surgery to take meticulous care of small lesions and produce healing than to perform major amputations. In a series of 100 consecutive cases of thrombo-angiitis obliterans only 3 major amputations were performed, all on persons who would not stop smoking. Most of the patients have been followed up for from two to eight years. For arteriosclerosis obliterans the figures are not so encouraging. Statistics on this condition have not been compiled. There is definitely a slower response to therapy; however, on the other hand, an increasing number of patients on whom amputation had been advised, today are working on the condemned leg as a result of conservative therapy.

The author urges that the recent trend in certain quarters toward submitting all patients with vascular disease to the same form of therapy be decried. The problems presented by different diseases and by different patients with the same disease are more frequently unlike than identical. Each should be given individual consideration before the therapeutic régime is started. It is important that the conception be overcome that peripheral vascular disease involves only the extremities. Each patient should be submitted to a complete study in order that evidence of vascular damage anywhere in the body might be discovered and proper therapy instituted.

When conservative therapy is selected for a patient with occlusive arterial disease, the choice of methods is wide; this indicates that, although several may be worthwhile, there is no specific cure. The immediate objects of the various forms of treatment are improvement of the circulation to the involved area by vasodilatation of the active vessels, widening of the collateral channels, and reestablishment of canals through old occluded vessels. Such procedures as seemed to the author to warrant discussion are described. Each of these procedures are evaluated in the light of the experience obtained at the clinic for vascular disease of the New York Post-Graduate Medical School and Hospital.

Whenever there is ulceration, gangrene, marked progressive discoloration, pronounced and sudden local coldness, or severe "rest pain" the involved extremity should be placed at relative rest. That level of the extremity which appears to be the most effective from the standpoint of proper blood supply should be the one maintained. Rest should be continued until the lesion is healed or the acute episode is completely over, after which activity should be undertaken guardedly and under observation until the return of the condition is considered unlikely.

The active vascular exercises of Buerger or of Allen have been found helpful if the feet are not too painful for their use. Once the diagnosis of the lesion is made, whether an acute condition is present or not, meticulous care must be taken of the extremities involved. The skin should be kept soft with olive oil or hydrous wool fat, and calluses carefully softened and removed.

The results of therapy in occlusive arterial disease due to thrombo-angiitis obliterans depend on the edict: "Absolutely no smoking, now and forever!"

In contrast, in the opinion of the author, the action of alcohol on the peripheral arteries is definitely vasodilating. The indications for baths, and the use of heat and of typhoid vaccines are discussed. After years of study, the author deems it fair to state that the value of the vasodilating

drugs singularly or collectively in the treatment of these conditions is relatively limited.

The author presents an extensive discussion of the values of mechanical therapy, the pressure suction boot, reactive hyperemia, and intermittent venous occlusion. HERBERT F. THURSTON, M.D.

BLOOD; TRANSFUSION

Benhamou, E., and Mercier, C.: Morphological and Physiological Modifications in Preserved Blood (Les modifications morphologiques et physiologiques du sang conservé). *Presse méd.*, Par., 1940, 48: 66.

According to the authors' observations, the number of red blood corpuscles in preserved citrated blood diminished slowly the first few days and more rapidly later on, falling to from 800,000 to 1,000,000 on the fifteenth day. The first three or four days the erythrocytes began to lose their normal shape; later on they shrunk gradually, and finally they assumed the aspect of blood corpuscles found in congenital hemolytic icterus. The use of Price-Jones's method of examination revealed a gradual diminution of large erythrocytes, a shifting of the average diameter to the left, and, toward the fifteenth day, a microcytic curve resembling that of an essential hypochromic anemia. Apparently two processes take place: a disappearance of aged large erythrocytes, and a contraction of more resistant corpuscles.

The number of reticulocytes underwent only slight fluctuations in the course of two weeks and the loss did not exceed 5 or 6 per cent. The reticulum became more condensed in course of time.

In spite of the aforementioned morphological modifications of the erythrocytes, their respiratory function, particularly their capacity for oxygen absorption, remained well preserved up to from the fifteenth to the twentieth day.

The time of the appearance of hemolysis varies greatly, and within wide limits is independent from the choice of the preserving fluid. In the authors' experiments Stocke's solution was used for preservation of the blood, and a slight pinkish discoloration of the plasma could usually be noticed between the thirteenth and twentieth day. According to their experience, citrated preserved blood represents a satisfactory mixture of hemoglobin, erythrocytes, and reticulocytes up to the fifteenth day.

As to the leucocytes, their number rapidly falls within the first week from 6,000 or 7,000 to 2,000 or even 1,000. The authors were able to observe an alteration and disappearance of the neutrophils on the first or the second day: granulations were less noticeable; the protoplasm became transparent; and the nuclei lost their lobulation and were transformed into dense masses. Monocytes also disappeared rapidly, while the medium-sized mononuclears persisted longer. The cytoplasm of the latter gradually diminished in size and a contraction of the nuclei made the cells resemble lymphocytes. The latter were the most resistant of all types. On the whole, the picture resembled more that of an agranulocytosis than that of a leucemia. The authors' observations did not confirm the repeatedly made statements that blood platelets undergo considerable modifications as to their shape and staining qualities, and disappear rapidly. Between the eighth and tenth day 150,000 blood platelets and after fifteen days from 30,000 to 50,000 platelets could still be counted. Not a direct counting in the customary chamber but the de Van Goisenhoven-Van Herwerden method must be employed if correct figures are desired. Among the formed components of the blood, the platelets are the only ones which are mobile. This property is well preserved the first three or four days; the staining ability of the platelets also remains unchanged. All the mentioned properties gradually disappear but are still demonstrable up to the seventh or tenth day; after that date a complete inertia replaces the mobility.

The authors conclude that up to the tenth day the preserved blood acts as a live blood. Therefore, blood which is preserved less than ten days can be used to a great advantage in hemorrhagic and infectious processes, while later on it can be considered only as a carrier of erythrocytes, hemoglobin, and oxygen.

If the blood is kept at room temperature for one or two days before being placed in a refrigerator, the blood platelets soon begin to diminish rapidly, and they lose their vitality and staining ability starting with the third or fourth day.

JOSEPH K. NARAT, M.D.

SURGICAL TECHNIQUE

OPERATIVE SURGERY AND TECHNIQUE; POSTOPERATIVE TREATMENT

Klicpera, L.: The Correction of Prominent Ears (Zur Korrektur der abstehenden Ohren). *Ztschr. f. Hals-usw. Heilk.*, 1939, 46: 367.

There are essentially two kinds of prominent ears: one is found when the angle which the medial surface of the concha forms with the rim of the ear is increased beyond the normal, which causes a badly formed anthelix on the lateral conchal surface; and the other when the insertion of the concha forms a wide angle, which may approach the vertical. The operative procedures for the two types must be different.

Operation for Type 1. An incision is made on the medial surface of the concha through the skin and cartilage in the line of projection of the anthelix from the superior crus down to the antitragus. The lateral perichondrium is stripped up for about 3 mm. from the incision line along both sides. In the direction of the incision an elliptical excision of skin and a somewhat narrower excision of perichondrium are carried out. For better adjustment of the edge of the cartilage which forms the anthelix a strip of cartilage about 1 mm. wide is generally excised along each border. After the rim of the ear is bent into a normal relationship with the anthelix, 1 or 2 perichondrial sutures are inserted, the skin in the medial surface of the concha is closed with fine silk sutures, and a pressure dressing is applied.

Operation for Type 2. (Correction of the conchal cartilage.) A horizontal incision in the skin is made in the middle of the concha from the furrow corresponding to the anthelix to about ½ or 1 cm. from the mastoid. After a small incision marker in the retro-auricular fold is made about ½ cm. below the upper margin of the ear and one about 1 cm. above the lower margin, a rhomboid section of skin is taken up by blunt dissection between the two incision markers and the end-points of the skin incision lines. The perichondrium is cut through along the skin incision and is stripped from the cartilage over the whole area of the concha. The conchal cartilage is then cut through parallel to the previous incisions and the lateral perichondrium is freed to the rim of the concha. Those parts of the cartilage which determine the projection of the ear are excised and the cartilage must be divided above and below at its attachment to the skull almost up to the margin of the ear. The spring of the cartilage at the margin of the ear may still hold it in its prominent position in spite of a wide excision of conchal cartilage. After the excision of the cartilage the ear must remain in its new position by itself. The perichondrium is closed with catgut sutures and the correction is completed. The skin excision which is now done plays no essential part but is made as small as possible and in such a way that the retro-auricular fold lies medial to the line of incision of the cartilage. Careful suture of the skin is done. The lateral surface of the concha is packed with small gauze pads in all its folds to prevent creases and hematomas. Skin sutures are removed on the fifth day and the gauze pads and binder on the eighth or ninth. By this method the disadvantages characteristic of the Eitner and Joseph operations, i.e., the abnormally flat retro-auricular fold and the impression of a very adherent concha, are considerably reduced.

(H. Beyer). Bradford Cannon, M.D.

Herrmann: New Points of View in the Treatment of Othematoma (Neue Gesichtspunkte bei der Behandlung des Othaematoms). *Ztschr. f. Hals.-usw. Heilk.*, 1939, 46: 363, 368.

Of the conservative methods of treatment of othematoma, moist compresses, heat, stimulating roentgen irradiations, and the application of a compression bandage are mostly employed. These measures have been supported with puncture and the injection of tincture of iodine or alcohol. The compression bandage presses the fluid aside out of the balloonlike protrusion, so that only the othematoma will be enlarged. If a puncture is made, a compression bandage must not be applied, and the ear must be protected from contact and rubbing.

In the great majority of about 70 cases observed over a period of more than seventeen years healing occurred following conservative treatment. Only 18 cases of greater severity were operated upon. The advantages of surgical treatment are the following: (1) the shorter duration of treatment, (2) the avoidance of the cosmetic thickening and deformity, and (3) the certainty of the result. The methods of Claus, Passow, Frey, and the author's own former method are described and the advantages and disadvantages of these methods are discussed. At the present time, the author proceeds as follows:

The othematoma is attacked not from the anterior, but the posterior aspect. A window is made in the cartilage; it is excised in the form of strips. The wound is primarily closed. This method provides better conditions for resorption. In addition, the skin of the anterior wall agglutinates firmly with the skin of the posterior aspect of the auricle, and thereby a healing of the othematoma must result.

(H. Beyer). Louis Neuwelt, M.D.

Santy, P., Chambon, M., and Sautreaux, M.: The Sterilization of Air in Operating Rooms (La stérilisation de l'air des salles d'opérations). *Presse méd.*, Par., 1940, 48: 68.

The unexpected appearance of infectious incidents and their frequent repetition in spite of all customary precautions attracted the attention of numerous surgeons to the aerial transmission of

infections in the operating room. Inasmuch as the presence of pathogenic micro-organisms in the air of the operating rooms has been repeatedly demonstrated, Trillat studied the condition of the germs in the atmosphere and found that microbes may float in the air in form of a suspension and that changes of the ionization of the air may produce a flocculation of the corpuscles. Humidity of the air causes an engorgement of the particles and creates an aqueous aureole able to dissolve organic gases and to serve as a culture medium. Lowering of the atmospheric pressure is followed by an expansion of gases and vapors which become easily detached from the ground or from the cutaneous surfaces, and thus increase the number of bacteria in the air. Conversely, a cold surface creates a condensation of the aqueous spherules in the air and of the bacteria contained in them.

Sterilization of the air of the operating rooms may be attempted in two different ways: (1) primary sterilization, done in the same manner as surgical instruments or dressings are made sterile, which may deprive the air of all living bacteria; and (2) continuous sterilization which would have as its purpose an elimination of bacteria as soon as they appear.

Lister used a spray of antiseptic solutions. Recently Masmonteil advocated sterilization of the air with vapors at 120 degrees. After an initial sterilization has been accomplished a continuation of it could be obtained by letting only aseptic or filtered air enter the operating room. It is also conceivable that the air in the operating room can be continuously sterilized by an electric current of from 25,000 to 100,000 volts passing metal tubes which admit the air from the outside. Finally, the bactericidal power of ultraviolet rays could be utilized for the same purpose.

Petri dishes placed in various parts of the operating room were exposed to the air for twenty minutes, this being an average duration of a short surgical intervention. Anaerobic bacteria and those not easily cultured could not be demonstrated with this method.

After being exposed for twenty minutes to the air of an operating room closed over night, a Petri dish 9 cm. in diameter contained after forty-eight hours an average of 11 colonies. The same experiment was performed with the surgical personnel, aseptically dressed, present in the operating room, and 36.5 colonies were counted, as an average, in the cultures after forty-eight hours.

The authors experimented with thymol, which possesses a high antiseptic power. A pine-needle oil was added to it as it lowers the surface tension of solutions. Finally, to increase the mechanical effect of the mixture, kerosene was added. The formula of the mixture was as follows: salol 2 gm., thymol 20 gm., terpineol 250 gm., and kerosene 730 gm. A spray was adjusted so that from 3 to 4 c.cm. were dispersed per each cubic meter of air. A commercial centrifugal atomizer was used for this purpose. Instead of 11 colonies, the contamination of air was thus reduced to 1.7 colonies in a non-occupied operating room.

In spite of impregnation of the air with the antiseptic mixture, two hours after the use of the operating room by the surgical personnel the average degree of contamination was 27.1 colonies. The authors concluded that the primary sterilization of the operating room is insufficient and should be supplemented by a continuous sterilization acting on microbes as soon as they are present.

They turn their attention to quartz lamps emitting ultraviolet rays. Air submitted to the action of the rays was forced through several layers of carbon which was absorbing the ozone; after that the air was guided through metallic filters retaining dust. The index of contamination of air after the application of ultraviolet rays fell to 9.3 colonies after one-half hour and to 1.8 colonies at the end of the first hour. If the operating room had been used for two hours by the surgical personnel, the average contamination was 5.7 colonies.

The authors consider the sterilization of air of operating rooms as a useful supplement to the customary aseptic measures. JOSEPH K. NARAT, M.D.

Kraissl, C. J., Cimiotti, J. G., and Meleney, F. L.: Considerations in the Use of Ultraviolet Radiation in Operating Rooms. *Ann. Surg.*, 1940, 111: 161.

These authors report observations made on the effect of ultraviolet radiation on bacterial growth and on wound healing. A Rentschler radiometer was used to measure the intensities of the radiations. The intensity was read directly in clicks per minute, an empiric value of the instrument. The intestines of guinea pigs were exposed to ultraviolet radiation and the longest time which intestines, kept moist with saline solution, could be exposed to radiation without the development of adhesions was determined. By exposing bacteria on agar plates to ultraviolet radiation it was found that the lethal points for various common bacteria fell below the safety line and left an adequate margin of safety. In the determination of the bactericidal effect of the radiation to organisms falling in the air, it was found that an intensity of 13 clicks per minute was required to kill bacteria falling a distance of 3 ft. in one minute through the air, while it took nine minutes to kill the same organisms on the seated plate. These observations were applied clinically and an ultraviolet generator was applied to an illuminating unit which concentrates the radiation in the most critical area, i.e., above the wound and at the level of the operator's exhalations. The generator automatically controlled the intensity of radiation and when the concentration was greatest, i.e., while the patient was being prepared, it gave the greatest amount of radiation.

The writers caution surgeons contemplating the use of ultraviolet radiation for the reduction of contamination in the operating rooms to determine

that the quality of radiation is in the most efficient part of the spectrum, and that the intensity is great enough to render the air sterile and yet not so great that it will injure tissue for the period of time it will be exposed. RULON W. RAWSON, M.D.

Henry, A. K.: A Technique for Removing Pulmonary Emboli. *Lancet*, 1940, 238: 349.

Pulmonary embolectomy was done on 3 patients, and though none was saved, a procedure has taken shape which serves to meet some of the difficulties encountered.

Skin preparation. As soon as operation is even considered, the whole front of the chest and upper part of the abdomen should be prepared.

Local anesthesia. If likelihood of operation increases, a triangle, of which the base on the left edge of the sternum measures a liberal span from the sternoclavicular joint, and the apex lies a span out along the second left rib, should be infiltrated. The epigastrium, too, should be injected, in view of cardiac massage.

Incision. The T-shaped incision cuts down on 7 in. of sternal border and on 7 in. of second rib and costal cartilage. The flaps of skin and pectoral muscle are turned back from the costal plane widely enough to let the operator proceed unhampered from this new surface, and so reduce the working depth of the wound. It is prudent to open the epigastrium at this stage.

Resecting the left second rib and cartilage. After superficial division, above and below, of the intercostal muscles, the sternal end of the cartilage is divided and used for drawing the rib away gently from the pleura, while a curved raspatory helps a finger to finish the extraperiosteal separation. At least 6 in. of rib plus cartilage should be resected—a wide removal which gives the great advantage of oblique access.

Exposure of the pericardium. With the pulp of the finger the edge of the left pleural sac is drawn outward. To do this without opening the pleura a spot at the lower border of the first costal cartilage is chosen, and a finger is worked gently under the mammary vessels and then under the manubrium. The finger should be aimed so as to reach the middle point of the manubrium, and when that point is reached the finger is flexed and the pleural edge is mobilized and retracted, for there the sac leaves its fellow and goes to its own apex. A very little care leaves the internal mammary vessels unharmed and close to the sternum. The gap left by the wide resection of the rib allows the apex of the lung to be mobilized and then flattened in a posterior direction within the sac of the pleura, a flattening which liberates the side of the pericardial cone and so gives better access to the pulmonary trunk, which slopes backward. Withdrawing the pleura reveals a variable thickness of propericardial fat, which is sometimes pink and feebly vascular; this is picked up by forceps and divulsed boldly with blunt nosed scissors down to the smooth face of the pericardium.

Opening the pericardium. The pericardium is caught near the sternal end with a fine toothed forceps, and opened longitudinally for at least 3 in. with scissors to expose the conus arteriosus of the right ventricle in company with the great trunks.

Catching and opening the pulmonary artery. The tip of the right index finger is slid into the transverse sinus and the pulmonary trunk is located and steadied. Each of the following methods is useful in locating the sinus:

1. The right index finger, slid vertically inside the pericardium opposite the second rib and kept in contact with the lining of the left wall of the sac, crosses over the left auricular appendix and goes straight into the sinus.

2. Outward retraction of the left wall of the pericardium brings to view the blunt, free tip of the appendix; and a finger is placed in the sinus a little behind and medial to this mark.

The pulmonary artery is the trunk next to the left end of the sinus. The assistant, standing on the right of the patient, catches the middle part of the artery with a fine tooth forceps held in his left hand, and makes a small transverse fold in its anterior wall. The surgeon withdraws his right finger from the sinus and occludes the stem of the pulmonary trunk close to the heart, between his left thumb and index finger. To prevent the forceps from tearing a friable trunk, the surgeon's finger must be replaced in the sinus by that of a second assistant, who thus relieves strain by supporting the vessel. With scissors, the surgeon now cuts longitudinally into the artery through the small transverse fold held by the first assistant. This opening should be just large enough for the cannula. The first assistant, using his right hand, now grasps each lip of the opening with a delicate hemostat, taking care to keep his original hold on the vessel with the toothed forceps till the second hemostat is on. Since the pericardium may contain oily fluid, it is well for the surgeon to wear cotton gloves over rubber ones.

Passage of the cannula. The surgeon, still occluding the lumen, passes the cannula through the opening. The first assistant forestalls hemorrhage by gently crossing the hemostats over the cannula. The surgeon may now release his grasp of the lumen; he uses his left thumb and index finger to press inside the wall of the vessel against the cannula, to fix the opening, and keep it shut when the cannula moves from branch to branch. A tap controls suction. Small clots go through the cannula; large ones stick in the nozzle and can be drawn out. Aspiration is stopped while the cannula moves from branch to branch, so that the blood may circulate past it. The directions of the main branches of the artery must be remembered; the left is almost perpendicular to the table, the right nearly horizontal. There is at no time interference with the aorta.

Closing the incised artery. After removal of the cannula, the hemostats are kept crossed at the lips of the opening, and the artery is closed with mattress

sutures. Then the pericardium and chest wall are closed.

Restoring the heart beat. With control of leakage from the arterial opening, attempts at restoration may start the moment the clot is out. After injecting 1 c.cm. of adrenaline into the exposed left auricle, bimanual rhythmic compression is made between a hand introduced under the diaphragm by laparotomy, and one in the thoracic opening. Arterial perfusion directed heartward may be tried, either by cutting down on the carotid artery in the neck and injecting fluid toward the heart, or by running the solution into the exposed aorta. The solution consists of 0.25 c.cm. of a saturated solution of calcium chloride in a liter of saline solution and comes, oxygenated at body temperature, from a funnel 6½ ft. above the patient. The object is to exploit the stimulus of filling the coronary vessels. Oxygenated blood might prove a better vehicle than saline solution for the calcium ion; perfused blood, at normal pressure, may be sent directly up the carotid trunk to feed the medulla. It is easy to reach the left carotid artery and the left subclavian and innominate trunks through the opening made in the operation.

The approach to the artery is greatly helped by tilting the chest with a pillow under the left scapula.

SAMUEL KAHN, M.D.

ANTISEPTIC SURGERY; TREATMENT OF WOUNDS AND INFECTIONS

Greene, R.: Frost-Bite and Trench Foot. *Lancet*, 1940, 238: 303.

It is pointed out that frost-bite and trench foot are essentially the same condition and are due primarily to cold. The former results from extreme cold with or without association of a high wind or a deficiency of oxygen; the latter follows exposure to lesser degrees of cold, and dampness and muscular inactivity are factors. In both conditions the essential pathological change is damage to the vessel walls, followed by transudation and edema, or even rupture and hemorrhage, into the surrounding tissues.

Prevention requires detection of ill health and malnutrition, knowledge of previous attacks which increase susceptibility, attention to clothing, and protection of the extremities, including care of the feet. In acute cases heat greater than that of the human body is recognized to be extremely harmful. The author believes that rubbing of the affected parts, even with snow, is dangerous and questions the use at this stage of machines for passive muscular exercise.

The frost-bitten part should be thoroughly but most gently cleaned, wrapped in dry sterile dressings and many layers of wool, and kept absolutely at rest. Anti-tetanic serum should be given even if abrasions are absent. Subsequent treatment should aim at avoidance of infection, absorption of the exudate, and restoration of the vascular condition. The development of gangrene requires adherence to the usual surgical principles. The line of demarcation may form slowly and appear to be considerably more proximal than the true level. When frost-bite develops at altitudes above sea level the early inhalation of pure oxygen from a face-piece is of definite value.

WALTER H. NADLER, M.D.

Bromeis, H.: Additional Experiments on the Distribution of Tetanus Toxin in Its Dissemination in the Animal Body (Weitere Versuche ueber die Verteilung des Tetanusgiftes bei seiner Wanderung im Tierkoerper). *Deutsche Ztschr. f. Chir.*, 1939, 252: 285.

The author has previously shown that the rapidity of the dissemination of the toxin from the focus to the regional motor nerve and to the spinal cord is unusually great, namely, about 1 cm. per hour, and that the main portion of the incubation period is taken up by the deposition of the toxin molecule in the nerve cells of the spinal cord and its response. In recent times American authors have disputed the transport by way of the motor nerves and have assumed that the dissemination takes place via the blood stream. It remained, therefore, to be proved with what rapidity and to what extent the tetanus toxin reaches the other motor nerves by way of the blood stream. A direct attack from the blood upon the central nervous system cannot well be assumed, as the content of blood in the brain can be exceeded, if at all, only by very slight amounts.

The author at first determined the amount of toxin and the rapidity of its transport in the regional motor nerves, The toxin is demonstrable in the regional nerves after one-half or one hour and travels 1 cm. per hour. The total amount of toxin passing through the nerves is determined as follows: every 1 cm. of nerve which already contains the toxin is inoculated into mice and all the amounts are then added. If 300 lethal mouse units are inoculated subcutaneously into a guinea pig, that is, 3 times the fatal dose, two-thirds of them are absorbed by the regional nerve; the greatest amount of dissemination of the toxin takes place during the second hour, and after the fourth hour the essential portion of the toxin has been taken up. The conditions of resorption do not change markedly even with larger amounts of toxin.

The author then extirpated the indicated toxin depots after different hours and inoculated them into other smaller guinea pigs, in which the course of the toxin was determined in the same way as in the poisoned animal. The following results were observed:

The poisoned animal could not be saved by excision of the depot of toxin even after two, four and more hours. The inoculated animal, on the other hand, remained alive after about eight hours. The depot of toxin in the first animal had practically rid itself of the toxin at this time, so that it could not react any more to the second. Even very large doses of toxin had disappeared after twenty-four hours.

The author then determined the amount of toxin which is taken up by way of the general blood stream and lymphatics and everywhere taken up by the motor nerves and transmitted to the central nervous system. For this purpose the toxin was injected into an extremity, and at various periods of time all the nerves of the three other extremities were excised *in toto* and inoculated into mice. With small doses of toxin the animals became only slightly diseased, but with larger doses they became more markedly diseased and died after twenty-four hours. In every case, it appeared that in this way only smaller amounts of toxin were transported, from one-third to one-twentieth of the total. At any rate, it seems highly probable that apparently the lymphatic apparatus outside of the central nervous system can also take up a portion of the toxin and make it innocuous.

The author then conducted some further experiments in order to paralyze the injected toxin by a counteracting administration of antitoxin. Mayer and Ransom have shown that antitoxin does not penetrate into the substance of the peripheral nerves. Intravenously administered antitoxin penetrates into the lymph only slowly and up to about one-third of its amount; when it is administered subcutaneously it reaches its maximum in the blood only after twenty-four hours. As soon as the toxin first becomes anchored in the central nervous system, the antitoxin no longer helps. In animals this is the case even after twenty-four hours. The author then found that the massing of the amount of antitoxin in a single powerful dose was more effective than continuous smaller doses in the total amount of single massive doses. Naturally, all of the author's findings cannot be directly applied to the cases of human beings.

At any rate, the author draws the following conclusions:

1. A prophylactic inoculation, possibly omitted on the first day, can be given even on the second and third day after the injury, and then with higher dosage according to weight. For, while the transport into regional nerves at the site of the injury proceeds very rapidly, about one-half or two-thirds of the incubation period is required for the deposition of toxin in, and intoxication of the central nervous system.

2. In man the transport by way of the blood and lymph streams probably plays a greater part than in the animal.

3. In the presence of existing tetanus, one must give as much serum in a single dose intravenously at the earliest possible moment on the first and second day as one dares, and locally in the tissue between the local nerve and the site of the injury.

In conclusion, the author emphasizes the fact that the results of his investigations are not in conformity with the view of American authors, namely, that the toxin is disseminated only by means of the blood and lymph tracts.

(Franz). Louis Neuwelt, M.D.

Parish, H. J., and Oakley, C. L.: Anaphylaxis After the Injection of Tetanus Toxoid. *Brit. M. J.*, 1940, 1: 294.

The authors report a case of anaphylaxis after the injection of the second of two doses of tetanus toxoid. Allergic phenomena, although alarming, appear to be rare; study in the case reported suggested that the reaction was due to some constituent of the medium in which the toxoid was prepared, possibly the Witte peptone. Adrenaline (1:1000) should always be kept readily available as a precautionary measure when the tetanus toxoid is injected.

Jacob M. Mora, M.D.

Pettavel, C. A.: Anti-Tetanus Vaccination with Anatoxin (Vaccination antitétanique à l'anatoxine). *Rev. méd. de la Suisse Rom.*, 1940, p. 2.

Pettavel notes that the incidence of tetanus varies widely not only in different countries but in different communities in the same country. The statistics of the Federal Bureau in Switzerland indicate an incidence of 1 case of tetanus per 150,000, but in certain cantons the incidence is definitely higher. In case of accident, it is often difficult to decide whether antitetanus serum should be given or not. French statistics indicate that the majority of cases of tetanus occur after very slight injuries. The prophylactic use of serum, however, does not seem to be indicated after every slight injury. Fatal accidents resulting from the use of serum are rare, but serum disease of greater or less severity is of relatively common occurrence. In France, where antitetanus serum has been widely used in prophylaxis, Ramon has shown that the immunity conferred by the injection of serum is of short duration; thus he has developed an anatoxin for prophylactic vaccination against tetanus. The immunity conferred by anatoxin is lasting, but it does not develop rapidly; the antitoxin content of the blood does not rise until after the second injection, which is given three weeks after the first; it attains the maximum after the third injection. The use of anatoxin, therefore, cannot protect an unvaccinated person against the immediate danger of tetanus from a wound. However, it has been found that a single injection of anatoxin given to a person vaccinated previously, even several years previously, causes an immediate rise in the antitoxin content of the blood. Hence if a person not previously vaccinated with anatoxin sustains an injury involving danger of tetanus infection, a dose of purified serum (from 3,000 to 5,000 units) should be given, preferably by Besredka's fractional method. A quarter of an hour later an injection of 1 c.cm. of anatoxin is given in a different area; fifteen days later a second injection of 2 c.cm. of anatoxin is given, and in another three weeks, a third injection of 2 c.cm. is given. A fourth injection may be given after a similar interval or after a much longer period. If a person who has been previously vaccinated against tetanus sustains an injury involving danger of tetanus infection, the use of serum is not necessary; an injection of 2 c.cm.

of anatoxin is sufficient to raise the antitoxin titer of the blood to a protective level. If the injury involves a considerable loss of blood, and hence a loss of a considerable amount of antitoxin, an injection of serum may be indicated in some instances.

Vaccination with anatoxin is indicated chiefly for those especially exposed to tetanus—soldiers, industrial workmen, farmers, and children. In children, especially, tetanus and diphtheria anatoxin may be combined; or a combined vaccination against tetanus, diphtheria, and typhoid may be employed when indicated. ALICE M. MEYERS.

Gold, H.: On the Value of a "Repeat" Injection of Tetanus Toxoid (Secondary Stimulus) in Active Immunization Against Tetanus. *J. Lab. & Clin. Med.*, 1940, 25: 506.

In a previous communication the author reported the results obtained after active immunization of 34 adults by means of a primary course of 2 injections of tetanus toxoid, alum-precipitated and refined. In the present paper, he reports the follow-up observations on 20 members of this group who were subjected to a third "repeat" (secondary stimulus) injection of alum toxoid.

Before the third dose of 1 c.cm. of tetanus toxoid, alum-precipitated and refined, was injected, all patients were bled, and the sera were titrated for tetanus antitoxin. All but 2 showed less than 0.1 unit per c.cm. These 2 had 0.1 unit each. Sixteen subjects received the secondary stimulus two hundred and seventy-two days after the second dose of toxoid. Four received the third injection three hundred and fifty-nine days after the primary course of immunization was completed.

The author has drawn the following conclusions:

1. One cubic centimeter of tetanus toxoid, alum-precipitated and refined, can be safely injected as a secondary stimulus in subjects who have previously undergone primary immunization against tetanus antitoxin by means of 2 injections of alum toxoid.

2. From five to seven days elapsed before the antitoxin level of the blood serum reached the minimum protective value of 0.1 unit, following the injection of this secondary stimulus ("repeat" or third dose).

3. The injection of this secondary stimulus produced in from seven to thirty days a very marked increase in the antitoxin content of the blood. The magnitude of this increase was in many cases at least fifty times the control value. Several subjects had 5.0 units or more of tetanus antitoxin per cubic centimeter of blood serum.

4. Following the injection of this secondary stimulus, the antitoxin titer appeared to be maintained above the minimum protective level of 0.1 unit for a longer period of time than was the case after the primary course of 2 toxoid injections.

5. The occurrence of an injury in subjects that have undergone primary immunization against tetanus requires the injection of a secondary or "repeat" stimulus (1 c.cm. of alum toxoid).

SAMUEL H. KLEIN, M.D.

ANESTHESIA

Monod, R.: Anesthesia in War Surgery. (L'anesthésie en chirurgie de guerre). *Anes. et anal.*, 1939, 5: 384.

In view of the fact that methods of anesthesia have been modified and extended since the World War of 1914, the author suggests that proper thought be given to the problem of anesthesia as it affects the armies and civil populations of countries at war today. Not only the soldier, but the civilian, is now subject to the possibility of injury. The type of injury has also undergone some modification, especially to civilians of all ages, because of the variety of poisons and inflammable gas bombs which are in present use. The discussion is taken up under three headings: (1) the old and new methods of anesthesia most useful under conditions of war; (2) the choice of anesthetic for use at various parts of the front and the interior; and (3) the question of securing the best possible administration of the anesthetic selected for each particular locale.

Medical grounds must be given the choice of anesthetic as far as possible, but military expediency definitely enters into the picture. The purely military basis of choice depends on several factors: the anesthetic should: (1) permit simple administration without complicated apparatus; (2) be of short duration and fast action; (3) be easy to transport; (4) be easy to store and not explosible; and (5) be manufactured in such a manner that a steady and indefinite supply may be assured. Still further purely military considerations affect the choice of anesthetic, and depend on whether it is to be employed in mobile units, base hospitals, or in large central hospitals. For mobile units, materials for anesthetic purposes must be reduced to a minimum, both in respect to the number and, especially, to cumbersome apparatus. Chloroform, evipan, and novocaine, all non-inflammable anesthetics, are selected for mobile units. For base hospitals, the equipment can be more complete and may include, in addition to those mentioned for mobile units, ethyl chloride and ether delivered to the patient from machines, nitrous oxide, and materials for spinal anesthesia. The choice of these will depend on the seriousness of the patient's condition. In large hospital centers well behind the front, the choice of anesthetic will depend to some extent on whether there are many wounded coming in or whether there is a period of lessened activity. In periods of calm, the choice may be made according to the preference of each surgeon, or according to the various specialties, even to the extent of quite special apparatus; consequently, nitrous oxide, cyclopropane, and rectal anesthetics may be added to those already enumerated.

In conclusion, the author discusses the organization of the personnel to give anesthetics, and he believes this to be a very important matter which should receive careful consideration. At best, military surgery is difficult surgery which has to be done unexpectedly and under variable conditions; above

all, it is urgent surgery on patients more or less in shock, usually worn out, cold, and exsanguinated, and often at the end of their nervous stamina. Anesthesia under these circumstances is an unfavorable enterprise and should be given only by a specialist who has proved his ability. Such an individual could be in charge of a unit with several people with less training under him. In time of stress nurses, dentists, and medical students could work under his direction. This would act to the great advantage of the patient and the operating surgeon.

The article is a plea for the proper organization of anesthesia, with all its latest developments, as it applies to modern warfare.

ADRIEN VERBRUGGHEN, M.D.

SURGICAL INSTRUMENTS AND APPARATUS

Shambaugh, P.: The Silk Technique. *Surgery*, 1940, 7: 9.

The modern widespread adoption of the silk technique is due to the fact that silk is cheaper, easier to sterilize, and less likely to cause infection in wounds than catgut.

The experiments here presented were done to test the tensile strength and holding power of knots and of stitches in silks of different sizes and differently prepared.

It was found that boiling or autoclaving does not decrease the tensile strength, although repeated boiling makes it more friable. Simple wetting of silk decreases its tensile strength by 25 per cent. This is regained on drying, but is prevented only temporarily by oiling or waxing. Oiled or autoclaved silk breaks less easily than untreated or boiled silk because of the temporary protection of the oil, and because autoclaved silk is dry when it is used by the operator.

Neither oil nor wax increases the tensile strength of silk, but these substances facilitate knots by increasing the "sliding power." A mixture of beeswax and vaseline gives the optimum combination of sliding power and holding power to knots and does not hinder sterilization.

Waxed or "serum-proofed" silk knots have poor holding power even when they are of the triple-throw type. Vaselined silk triple-throw knots are reliable, and untreated silk holds well with square knots only. These types of knots should be used with these materials.

The length of the free ends of the knots makes little difference in their tensile strengths, whether the material is untreated, serum-proofed, or vaselined silk, or plain or chromic catgut. Tests as to the proper type of knot to be used for catgut leads to the conclusion that triple-throw knots should be used in all plain catgut and in the larger sizes of chromic catgut, whereas square knots will suffice in the smaller sizes of chromic catgut.

Determinations of the proper size of silk to be used, based upon the holding power of various tissues, leads the author to the conclusion that a strand 0.005 in. in diameter with a tensile strength of 3 lb., although somewhat larger than is necessary, is more easily handled than finer silk and is most satisfactory for routine use.

Tests on suture lines made in cloth showed that their strengths increase with the number of stitches used, although not in mathematical proportion. A continuous suture is stronger than a row of interrupted sutures with a corresponding number of stitches, because there are only 2 knots to weaken it. More is obviously at stake, however, in the continuous suture, because one break will forfeit the whole suture line. The way to increase the strength of a suture line is to increase the number of stitches rather than the size of the suture material.

From the standpoint both of using all the holding power of a weak tissue and of getting a strong suture line, a row of interrupted sutures is as strong as one of figure-of-eight stitches, and stronger than one of mattress stitches.

RICHARD WARREN, M.D.

PHYSICOCHEMICAL METHODS IN SURGERY

ROENTGENOLOGY

Hirsch, I. S.: Fluorography. The Photography of the Fluorescent Image. *Am. J. Roentgenol.*, 1940, 43: 45.

The history of fluorography is briefly reviewed. In April, 1896, Bleyer constructed a "photofluoroscope" for photographing the fluorescent image. Many others have ventured into this field, but De Abreu was the first to apply such a method on a large scale, in 1930.

The apparatus, as used by Hirsch, consists of a light-proof box of pyramidal shape with a fluoroscopic screen at one end and a camera at the other, and means for adjusting the height of the apparatus. Either a zinc sulphide or a Patterson "B" screen may be used, high speed panchromatic film being used with the latter, and a special film developed by Eastman with the former. Using a 35 mm. film camera with an F 1.5 lens, the roentgenographic exposure required with this material is about twelve times that necessary for the same subject with the standard double coated roentgen film and high speed intensifying screens. For the average chest 80 kv. peak, 150 ma. and 1/10 second exposure at 30 in. tube-screen distance is necessary. A positive method of film identification is described.

The finished film may be projected or viewed with a magnifying glass. It appears to be preferable to mount each film separately in a 2 by 2 in. slide, with a paper mask on which is written any information desired. These slides may be filed in shallow filing cases.

The small fluorographic film in no way compares with the regular film in sharpness of detail and contrast, but is quite satisfactory for a gross survey of the chest. Its greatest field of usefulness is in the study of the lungs, particularly for the determination of tuberculous changes. It is not intended as a method of fine differentiation as to the type of the lesion.

HAROLD C. OCHSNER, M.D.

Waldenstrom, J., and Kjellberg, S. R.: The Roentgenological Diagnosis of Sideropenic Dysphagia. *Acta radiol.*, 1939, 20: 618.

In the years from 1936 to 1939 the authors found an average of 13 cases of sideropenic (Plummer-Vinson's) dysphagia annually. Comparison with the incidence of other diseases of the esophagus leads to the conclusion that dysphagia of this type is the most common esophageal lesion observed. The history of the Plummer-Vinson syndrome, which the writers prefer to re-name sideropenic dysphagia, is carefully reviewed.

The clinical manifestations of this disease are: essential hypochromic anemia, koilonychia or spoon nails, a smooth reddish tongue, fissures in the corners of the mouth, achlorhydria, and frequently vulval burning and itching. One of the most characteristic clinical manifestations is the difficulty in swallowing. The patients frequently note pain or a burning sensation when the food bolus passes behind the larynx, or they have a sensation that the bolus sticks at this level. The dysphagia is usually of long standing and the patients are frequently thin and emaciated as a result of dietary restriction. The typical dysphagia may be found in the absence of anemia.

The radiological manifestations of this disease are best studied by lateral and frontal views of the esophagus. The radiographic exposure should be made exactly at the moment when a bolus of thick barium solution passes the lower part of the hypopharynx and the upper part of the esophagus. The authors have found that an exposure time of from .03 to .05 second is desirable. The normal appearance of the hypopharynx and upper part of the esophagus is best visualized in the lateral view. The mucosal surfaces appear to be practically smooth and the lumen is usually from 15 to 20 mm. wide. In the frontal view the lumen is normally somewhat wider in the hypopharynx and continually narrows toward the esophagus. The outlines are normally smooth. In sideropenic dysphagia the site of the lesion is usually found in the upper part of the esophagus, just below the cricoid cartilage, or occasionally lower down but never as low as the arch of the aorta. In most instances the findings are best visualized in the lateral view, in which one or occasionally several very thin defects measuring from 0.5 to 6 mm. in length are seen pointing into the lumen at about right angles to the wall. The appearance is that of a thin membrane. In somewhat more advanced cases these changes are also seen on a frontal view, with small incisions in the lateral outline. The changes may be very slight and in such instances are seen only on maximal dilatation of the esophagus.

The treatment of the disease consists of the administration of iron in large doses to relieve the anemia, and in some cases the passing of an esophageal bougie. There is not always a definite change in the radiological picture accompanying the subjective improvement noted after treatment.

A number of cases are reported and an excellent group of illustrations is appended.

HAROLD C. OCHSNER, M.D.

Rathbone, R. R.: The Roentgen Diagnosis and Therapy of Retropharyngeal Adenitis. *Am. J. Roentgenol.*, 1940, 43: 25.

Retropharyngeal adenitis or early abscess is often difficult to diagnose because of the normal variations in the size of the retropharyngeal space caused by respiration. The anatomy, pathology, and clinical considerations are reviewed briefly, and both normal

and pathological findings of 100 infants from birth to three years of age as revealed by lateral roentgenograms are reported. The technique used in making the examinations is described and the findings are tabulated.

In the past two years 20 cases of retropharyngeal adenitis were diagnosed. All but 3 of these were treated by roentgen therapy, the details of which are included. The retropharyngeal swelling disappeared entirely in all of them after variable periods after two weeks. In none of the cases did the glandular process go on to suppuration. Two cases are reported in detail.

The following summary is appended:

1. The normal retropharyngeal space during inspiration in infants and children should not measure over 11 mm. with ordinary roentgenographic distances.

2. A retropharyngeal swelling is usually due to some focal infection in the upper respiratory tract, often the nasal accessory sinuses.

3. If both the focal infection and the retropharyngeal swelling, usually found in adenitis in the early stages, are treated promptly with roentgen therapy, a retropharyngeal abscess rarely develops.

ADOLPH HARTUNG, M.D.

Ledoux-Lebard, R.: Recent Advances in the Roentgen Diagnosis of Gastric Cancer. *Brit. J. Radiol.*, 1940, 13: 37.

Advance in the roentgen diagnosis of gastric cancer has been due largely to the recognition of the fallacy or inadequacy of the following common concepts of the condition:

1. That it inevitably means a disease of utmost gravity and of very short duration.

2. That the continuous loss of both appetite and weight is a cardinal and unfailing symptom.

3. That, because of the usual and prolonged absence of pain, the patient usually seeks the advice of his physician and of the x-ray specialist only when it is already too late for curative surgery.

4. That an early x-ray diagnosis is, therefore, only an exceptional possibility.

The author cites several cases in detail in evident contradiction to such dogmas and emphasizes the great diversity of the clinical picture and the utter impossibility of a merely clinical diagnosis of incipient gastric cancer.

Although progress in roentgenological technique has solved many of the problems of the early recognition of gastric cancer, some still await solution, and the author believes that better and more objective teaching is needed to reach this solution. Early diagnosis of benign lesions, which frequently are precursors of malignant ones, plays an important rôle. The knowledge gained regarding gastric ulcers and the malignant degeneration of some of them has been of great value. The size, site, shape, and contour of the niche often tend to prove its real nature. Gastric cancer frequently starts as a localized ulceration or infiltration, and the latter at first produces a sort

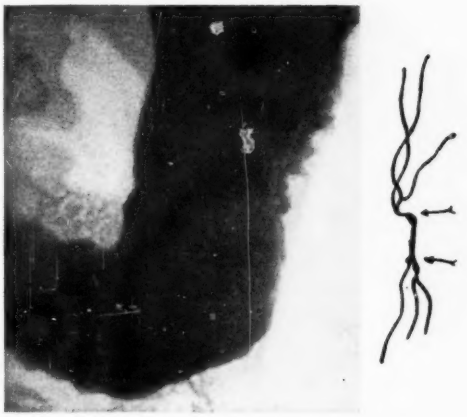
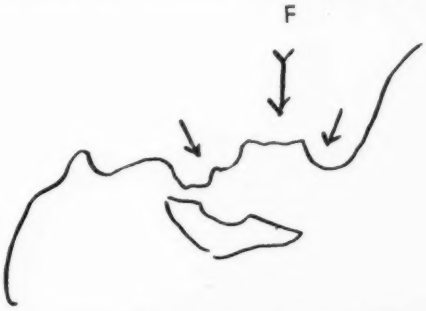


Fig. 1.

of step of limited denivellation on the small curvature. This may not be evident fluoroscopically but serial films may demonstrate it quite conclusively. Even before the "meniscus" sign is apparent, the



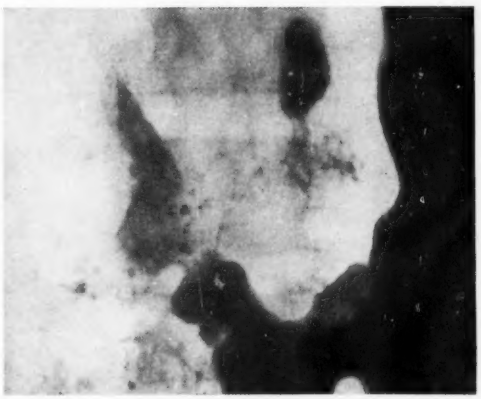


Fig. 2.

infiltrated and stiff portion of the stomach wall is often limited by deeper steps and seems "fitted into" the wall of the stomach. The permanence of such an image is highly suspicious of cancer. These changes are illustrated diagrammatically and by roentgenograms of proved cases (Figs. 1 and 2).

The roentgen picture may be more valuable and a more certain factor of diagnosis than sight and touch. The findings of the surgeon at operation may be deceptive unless checked by histological section. The possibility of error after thorough roentgen examination in competent hands is relatively small and the dangers of operation in those cases are more than offset by fatalities from unrecognized cancer. In questionable cases, test treatments may be instituted but if the roentgen picture remains unchanged or progresses during such treatment even though clinical improvement occurs, the diagnosis of malignancy would appear to be established and the need for gastrectomy be indicated. ADOLPH HARTUNG, M.D.

Williams, E. R.: Intussusception: A Radiological Study. *Brit. J. Radiol.*, 1940, 13: 51.

This paper presents proof that roentgenology has a distinct rôle in the diagnosis of intussusception and, in certain cases, also has a therapeutic value. A brief account of the pathology and clinical features of the condition is included. The varieties are classified on an anatomical basis with their relative incidence and the various forms are described and illustrated diagrammatically. Brief consideration is given to the cause and to anatomical, physiological, and pathological factors which have a bearing on its production. Acute, subacute, and chronic types occurring in infants and children, and chronic types in adults are discussed from the clinical angle.

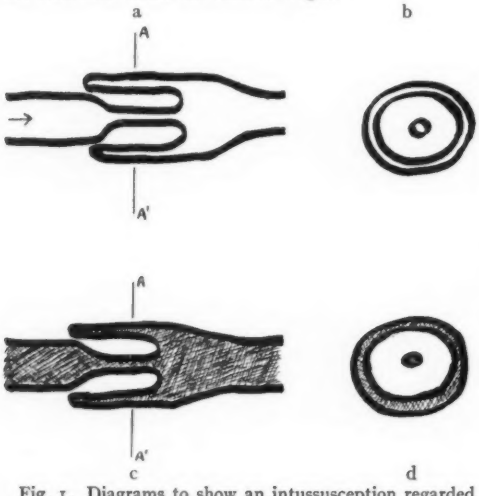


Fig. 1. Diagrams to show an intussusception regarded as three concentric cylinders. The shading in c and d shows areas which may be entered by contrast medium.

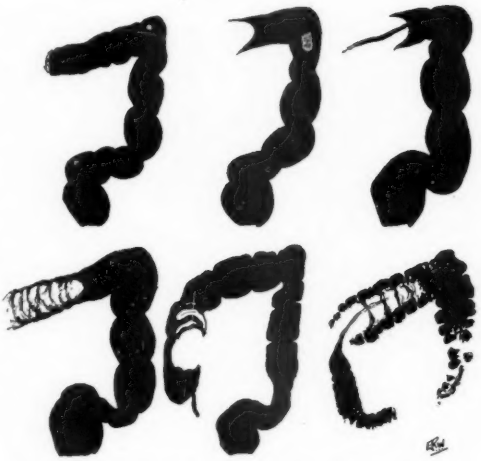


Fig. 2. Roentgenological appearances of intussusception.

The roentgenological diagnosis is reviewed briefly from the historical standpoint. Its basis is described and pictured schematically. The findings depend on the distribution of the contrast medium and also on the site and type of intussusception and on the mode of giving the contrast medium.

The signs from the barium enema are as follows:

1. Complete arrest of the enema.
2. Transient arrest of the head of the enema with a gradual movement proximally toward the cecum.
3. The enema meets the apex of the intussusception centrally in the lumen, but the emulsion creeps around the defect peripherally to become arrested.
4. Considerable "ensheathment" by the emulsion may occur and leave a large central filling defect in the long axis of the colon; the emulsion is "filmed-out" in a characteristic manner and a series of coarse, somewhat irregular bands is seen; these bands tend to be parallel to one another.
5. Rarely, the emulsion may enter the central cylinder as a thin streak with fine longitudinal markings.

With the exception of the sign of total stenosis, all of the signs described may be fixed at any one stage, but all may be developed in the order described. Several cases are cited in detail and characteristic roentgenograms of them included. Explanations for errors in diagnosis and points in differential diagnosis of the various forms are also given.

In chronic cases both the opaque meal and enema may provide useful information. The signs from a barium meal are as follows:

1. Dilatation of the gut above the invaginated portion.
2. Abrupt narrowing over a varying length of that part of the gut which is the central cylinder of the intussusception.
3. Varying degrees of the "ensheathment sign."

Fig. 3.

Fig. 4.

Fig. 5.

Figs. 3, 4. Ileocecocolic intussusception. Barium enema was given which flowed to the hepatic flexure without obstruction; at this level there was an arrest with slight ensheathment: this segment of the gut was seen "end-on" and shows a striking appearance of a peripheral ring about a large central negative defect.

Fig. 5. Same case as in Figs. 3 and 4. Pressure alterations produced no change, and only after moderate manipulations was a partial reduction effected: none of the emulsion reached the lower cecal pole.

Detailed case histories with roentgen findings obtained in this manner are included. Differential diagnostic points of various conditions are mentioned.

The value of plain film examination of the abdomen in connection with intussusception is also discussed and illustrated by a case report with a roentgenogram. The signs mentioned as of diagnostic value on such film are:

REMOTE SIGNS

1. Absence of the usual mottled appearance of the cecum due to slight gas and fecal content.
2. Collection of gas-distended small gut loops in the region normally occupied by the cecum.

LOCAL SIGNS (SCHATZKI)

1. Homogenous opacity of the intussusception.
2. Peripheral concentric ringing by translucent gas.
3. Conical stenosis of the small gut as it enters the intussusception.
4. Direct visualization of the tumor mass responsible for the intussusception.

The technique of making opaque enema examinations in connection with intussusception is described in detail and attention is called to what should be looked for during the fluoroscopic observations.

The possible therapeutic value of the barium enema is discussed in the light of statistical data gathered from various sources. Its usefulness in selected cases is stressed and the following advantages from giving such an enema are mentioned:

1. The diagnosis of intussusception will be confirmed.
2. If no reduction is effected, the surgeon will be aware that he may find operative reduction hazardous.
3. If a partial reduction is effected, consequent operative reduction is probably facilitated.
4. If reduction is apparently complete, no operation need be performed immediately, but close observation should be kept on the infant and the barium enema repeated within twenty-four hours.

The following conclusions are appended:

1. In cases of subacute and chronic intussusception in adults, the most precise pre-operative diagnosis as to the presence of the invagination and as to its cause will be realized from combined contrast-meal and enema examinations.
2. In acute intussusceptions in infancy, a precise diagnosis will be afforded by a barium enema in all cases except those of the ileo-ileal type. When the clinical diagnosis is uncertain, the barium enema is certainly indicated. Even when the clinical diagnosis is certain, the enema will provide a valuable therapeutic method in all but advanced cases and may render an operation unnecessary, or, if one is necessary, make it easier.
3. A wider use of roentgenological investigation in intussusception is clearly justified.

ADOLPH HARTUNG, M.D.

Piombo, F. S. J.: Arthropneumoroentgenography (Artro-neumo-radiografía). *Bol. inst. de clín. quir.*, Univ. de Buenos Aires, 1939, 15: 971.

The authors consider roentgenography of articulations after a preliminary insufflation of air as a valuable addition to their diagnostic measures, which offer great advantages over exploratory arthrotomies as they are completely harmless and technically easy. The authors employed the method for visualization of the shoulder, elbow, hip, knee, and ankle. The method proved to be most useful in

the diagnosis of the lesions of the knee joint, as it differentiated the conditions usually responsible for the so-called internal derangement of the knee. Embolism, chemical synovitis, emphysema, or a fatal outcome as a result of insufflation have never been observed. Aseptic precautions are essential. The interpretation of the arthropneumoroentgenograms is based on the thorough knowledge of normal conditions. Traumatic lesions of the menisci, free articular bodies, tears of the capsule or of the lateral ligaments, deforming arthritis, chondromas, osteomas of the capsule, specific arthritis, and Loewen's or Pelligrini-Stieda's disease can be easily diagnosed with this method, but lesions of the crucial ligaments cannot be recognized so easily.

The author was not able to form any definite opinion as to the therapeutic value of the insufflation of air. His experience is based on 44 insufflations performed under local anesthesia. As the contrast medium, perabrodyl was used.

JOSEPH K. NARAT, M.D.

Scott, S. G.: Wide-Field Roentgen Therapy. *Am. J. Roentgenol.*, 1940, 43: 1.

Deep, or, as the author considers it, surgical roentgen therapy, means the use of roentgen rays of very short wave length, thick filters, a small radiation field, and large doses; the effect is of a destructive nature.

Wide-field roentgen therapy entails the use of roentgen rays of medium wave length, light filters, a large radiation field (the whole trunk), and small doses. The author describes this method as "medical roentgen therapy," and believes that the only thing the two methods have in common is the use of the same agent.

In the work here described use has been made of the "wide angle" tube. With this apparatus the favorable effect on the patient diminishes if the tube is farther than 20 in. from the skin, even though the full number of roentgens is applied. From 60 to 100 roentgens measured in the center of the radiation field represent the average dose required to produce the signs of saturation or of tolerance which are necessary to obtain results.

Signs of saturation varying from a curious abdominal sensation to an unusual taste and gain in weight are said to occur, and these various and apparently entirely unrelated symptoms are enumerated. An equally startling array of conditions which have been treated is enumerated. The author believes that the result of treatment is a raising of the general resistance to disease comparable to the effects of ultraviolet rays, or sunlight.

HAROLD C. OCHSNER, M.D.

Dresser, R., Rude, J. C., and Cosman, B. J.: The Differences Between 200-Kilovolt and Supervoltage Roentgen Therapy. *Radiology*, 1940, 34: 13.

For two years the authors have been operating a specially constructed 1,000,000-volt constant potential machine for the treatment of malignant disease. They report both the physical and therapeutic differences noted by them in connection with it as compared with 200-kv. equipment. Absorption measurements in copper indicated that the 10-cm. depth dose, with a 100-sq.-cm. portal of entry, is some 15 to 20 per cent higher with the supervoltage equipment than with a 200-kv. unit, measured under similar conditions. Surface back-scattering is greatly decreased at the higher voltage as is also the lateral scattering within the depths.

As regards skin tolerance, pronounced differences in favor of the shorter wave lengths were noted, not only in the immediate superficial reactions but also in the late skin damage. A mucositis, developing after supervoltage therapy, appears earlier, is more intense as compared to the skin reaction, and is of shorter duration than when produced at lower voltage. The symptoms of roentgen sickness frequently are less pronounced at the higher voltage. The effect on the hemopoietic system is more profound with the shorter wave lengths. The reaction in the deeper tissues is biologically greater in effect than ionization measurements indicate in connection with supervoltage therapy. Since the depth dose with it is largely independent of the size of the portal of entry, numerous small fields may be utilized to advantage with it to effect greater changes in the deep tissues.

ADOLPH HARTUNG, M.D.

Packard, C.: The Biological Measurement of High-Voltage Radiations. *Radiology*, 1940, 34: 17.

With the recent development of high-voltage radiation, the need for biological measurements of the effectiveness of such radiation is being felt increasingly because both clinical and experimental evidence indicates that the effect does not conform to reactions obtained with lower voltage beams. The quantitative effects of very short radiations, the doses of which are measured by the dosimeters now available, are less than anticipated. It is generally admitted that doses of supervoltage roentgen rays have not been satisfactorily measured in terms of standard roentgens, for which reason the validity of an assumption that such radiations are less effective biologically than softer rays cannot be based on such measurements. The use of the fruit fly, drosophila, for this purpose is now well established, and the information which may be obtained with it are described at some length.

Using this biological method, 3 series of experiments were made with voltages of from 200 to 900 kv. The first series consisted of tests for the purpose of calibrating the Victoreen dosimeter against the biological standard; the second was a measurement of surface doses; and the third, a measurement of depth doses in a water phantom. Details of these experiments are described and the results tabulated. It would appear that the intensity of x-ray beams produced at 400 kv. and higher, measured by the biological method, is substantially lower than the intensity registered by the Victoreen dosimeter.

Variations of surface and depth intensities are also discussed at some length. In common with the observations of others, it was found (1) that surface intensities decrease in magnitude as the voltage increases, and (2) that the depth intensities remain fairly constant over a wide range of qualities, and show little or no tendency to increase with increasing voltage.

A practical application of these data is also tabulated. From these figures it appears that when the half value of the beam increases from 5 to 8, representing an increase in voltage from about 400 to 900 kv., the augmentation in the dose is small; namely, 15 roentgens, or 3 per cent of the skin dose. The advantage of very high voltages, therefore, is very slight, if the criterion by which they are judged is the percentage of depth dose or the amount of radiation which can actually be delivered at a depth of 10 cm.

ADOLPH HARTUNG, M.D.

Pfahler, G. E.: Roentgen-Ray Treatment of Hyperthyroidism. *Radiology*, 1940, 34: 43.

Roentgen therapy of hyperthyroidism has resulted in cures in about 65 per cent of the cases, in marked improvement in from 20 to 25 per cent, and failures in about 10 per cent, and these results, in the opinion of the author, approximate those of surgical therapy. The author believes that roentgen therapy has the additional advantage that patients are less likely to delay consultation if they know that not all cases must be subjected to surgery. Irradiation is indicated in all cases of hyperthyroidism in which the patient is not in crisis, or is not suffering from definite pressure symptoms. Operation should be recommended in all simple or non-toxic goiters unless there is some contraindication.

Roentgen therapy has the advantage that the patient can pursue his occupation without interruption, there is no pain or shock, no risk of death, and no scar, and patients who are found to be poor operative risks can be treated without any strain upon them.

Among the dangers of irradiation therapy is the risk of burn, which is eliminated by careful measurement of the dosage. Telangiectasis and skin atrophy occurred in 3 per cent of a series of 533 cases previously reported by the author, but he has noted no injuries of this type in any recent case. Exacerbation of symptoms may occur rarely after the first treatment. Myxedema has not occurred in any of the author's cases. Adhesions are not produced by roentgen therapy. Relief of the symptoms is noted approximately as soon after irradiation as after surgery, but it is not as complete. If irradiation is considered the patient is likely to be treated before any permanent cardiac impairment occurs, and as a consequence any delay occasioned by the slower response to roentgen therapy is nullified. The author believes that irradiation prevents the development of carcinoma in toxic adenomatous goiter or, if cancer is present at the beginning of treatment, irradiation stops the growth of the carcinoma.

The technique used by Pfahler in the treatment of hyperthyroidism is carefully outlined. Using 130 kv., 5 ma., 6 mm. of aluminum, and a distance of 30 cm., two anterior and two posterolateral cervical fields are treated. The anterior field, a truncated cone in shape, is arranged so that the inner border is near the median line. One centimeter is allowed between the anterior fields centrally, and the upper limit comes just to the upper border of the thyroid; the lower border extends below the clavicle and includes the thymic area. The rays are directed medially and downward. The two posterior fields meet the anterior fields to within about a centimeter, and the rays are directed downward and inward. From 30 to 40 per cent of an erythema dose (from 210 to 280 roentgens) is given through each of these portals, usually on one day. The series is repeated in three weeks, then in four weeks, and after that the interval is increased according to the improvement obtained. More than six series are rarely necessary, and the patient usually receives from five to eight series. It is inadvisable to use iodine in conjunction with roentgen therapy.

HAROLD C. OCHSNER, M.D.

Neely, J. M., and Rogers, F. T.: Roentgenological and Pathological Considerations of Ewing's Tumor of Bone. *Am. J. Roentgenol.*, 1940, 43: 204.

Roentgenograms in a classical case of Ewing's tumor show the lesion to be located usually in the diaphysis or metaphysis of the long bones. Early tumor development shows a slight thickening and increased density of the bone cortex. Later, mottled rarefaction and periosteal reaction showing lamination parallel to the long axis of bone may occur. In still later stages there may be swelling of the soft parts, more bone destruction, and, rarely, infiltration of the epiphysis. The only alteration found in the marrow cavity is irregularity and narrowing due to the thickened cortex. Pathological fracture rarely occurs. The tumor is extremely radiosensitive.

Atypical variations of Ewing's tumor are often encountered. In these, roentgen examination may show only bone lysis or sclerosis. Unusual sites of origin such as the spine, clavicle, skull, or pelvis may be encountered. When the tumor arises in flat bones, lysis is often the only roentgen evidence of disease. Periosteal reaction may be absent or when present may take the form of spicule formation perpendicular to the shaft, a common sign in osteogenic sarcoma.

Similar bone changes may occur in chronic osteomyelitis, syphilitic osteitis, metastatic neoplasms, tuberculosis, leucemia, Hodgkin's disease, metastatic neuroblastoma, and xanthomatosis. The differential signs are mentioned. Usually confirmatory clinical and pathological data are necessary before a definite diagnosis can be made.

The typical microscopic appearance is said to be the only constant finding in Ewing's tumor. Though this is true in some degree, the histopathology may be as variable and confusing as the roentgenogram.

In the classical example, sections show dark-staining round cells closely packed with practically no intercellular reticulum. The cell has a very thin rim of cytoplasm, a large nucleus with thin nuclear membrane and chromatin arranged in no particular pattern. In bone, masses of tumor cells invade lacunar spaces where osteoid tissue and osteoblastic activity give evidence of reactive bone formation. Osteoclasts may be found about the margins of dead bone. The tumor cells do not form bone.

In atypical tumors cellular monotony is less marked and varying amounts of intercellular substance may be observed. Occasionally tumor cells show cytoplasmic processes and hyperplastic reticulo-endothelium may be present. The pathological differentiation in these atypical cases may be just as difficult as the roentgenological.

Five cases presenting typical roentgenological and pathological findings are cited in detail. Two cases of lymphoblastoma, and 2 of primary neoplasm, probably round-cell sarcomas, in which the roentgen or microscopic appearances resembled those of Ewing's tumor are described at length.

Consideration is given to the marked variance of opinion regarding the histogenesis of Ewing's tumor. Study of the authors' material indicates that the tumor arises in the cortex or beneath the periosteum. The authors believe that Melnick's contention, that the cell of origin in Ewing's tumor is the undifferentiated mesenchymal cell which in postnatal life is found about small blood vessels and capillaries, is supported by their findings. In their opinion Ewing's tumor constitutes an intergradation with lymphoblastoma and myeloblastic tumors, on the one hand, and with fibrosarcoma and osteogenic sarcoma, on the other. Histopathologically it cannot be considered a neoplastic entity.

ADOLPH HARTUNG, M.D.

MISCELLANEOUS

CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

Long, C. N. H., Katzin, B., and Fry, E. G.: The Adrenal Cortex and Carbohydrate Metabolism. *Endocrinology*, 1940, 26: 309.

These authors have gathered together the available experimental evidence which in their opinions justifies a belief that the hormone of the adrenal cortex plays a direct and positive rôle in the control of both carbohydrate and protein metabolism.

Adrenalectomized mice and rats which are fed and maintained in good health with sodium salts exhibit practically normal carbohydrate oxidation and storage. In fasting animals, however, there is a rapid fall in liver glycogen which is ultimately followed by a depletion of the muscle glycogen and hypoglycemia. The fasted animals also excrete less urinary nitrogen, a fact which is assumed to be indicative of diminished protein catabolism. Since the blood sugar during fasting is probably maintained by protein catabolism, the occurrence of hypoglycemia in fasted animals is easily explained.

The injection of cortical extract or active crystalline adrenal steroids into normal or adrenalectomized fasted mice and rats is followed by large increases in liver glycogen and slight hyperglycemia. Since the liver glycogen is depleted by fasting, a new formation of glycogen from non-carbohydrate sources must occur. Accompanying this elevation of carbohydrate levels of the liver and blood is an increased nitrogen excretion which suggests that the extra carbohydrate results from increased protein catabolism. In fed animals there is less glucose oxidation, and large quantities of glycogen are deposited in the liver. Under these conditions the muscle glycogen may also increase.

The preparation and care of partially depancreatized rats is described. Evidence gathered from experiments on these animals substantiates the observations on adrenalectomized and normal rats. In partially depancreatized rats any marked change in the ability to form or utilize glucose is reflected by the level of the glycosuria. Adrenalectomy in these animals, with subsequent maintenance on sodium salts, brings about a reduced glucose excretion. The administration of cortical extract and certain steroids to these animals increases the glycosuria of those with intact adrenal glands and causes a reappearance of glycosuria in the adrenalectomized animals. The authors conclude that certain steroids of the adrenal cortex that are capable of maintaining life and a normal electrolyte balance in adrenalectomized animals affect the carbohydrate metabolism of partially depancreatized rats.

Hypophysectomy also is followed by marked alterations in the carbohydrate metabolism. Not only may the general condition of fasted hypophysectomized rats be greatly improved by the injection of adrenal cortical extract, but alterations in carbohydrate and protein metabolism may occur which are similar to those found in normal and adrenalectomized rats.

In fasted hypophysectomized, depancreatized rats adrenal cortical extract exhibits a diabetogenic action. Both the blood glucose and the urinary nitrogen are increased. Experiments on the diabetogenic effect of extract from the anterior lobe of the pituitary gland in adrenalectomized, depancreatized animals, however, indicate that not all of this activity is due to the adrenal cortex, but rather that a synergism exists between these two hormones.

EDWARD W. GIBBS, M.D.

Jentzer, A.: The Surgical Treatment of Diabetes and of Diabetic Gangrene (Le traitement chirurgical du diabète et de la gangrène diabétique). *Bruxelles-méd.*, 1939, 20: 78, 100.

Jentzer states that there are two mechanisms that regulate the carbohydrate metabolism; one acts to lower the blood sugar, the other to increase the blood sugar. The former is under the control of the pancreas and the parasympathetic system, the latter under the control of the adrenal glands and the sympathetic system. In normal persons, these two systems are in equilibrium and maintain the blood sugar at a normal level. In diabetes and diabetic gangrene the indications for operation depend upon whether the hyperglycemia is due to failure of the pancreatic function and deficiency of insulin, or to hyperfunction of the adrenal glands and excess adrenalin. In true pancreatic diabetes, adrenalectomy is not indicated, and in case of gangrene in this type of diabetes, amputation of the affected part gives the best results; the diabetic condition may show some improvement after operation. When, however, the hyperglycemia is caused by excess adrenalin, the adrenosympathetic hyperfunction is the chief cause of the gangrene, and this is best controlled by adrenalectomy (removal of one adrenal gland), without amputation of the affected part.

In order to distinguish between these two types of diabetes and diabetic gangrene, the changes in the blood-sugar curve induced by the injection of adrenalin, by the ingestion of 50 gm. of glucose, and by the injection of gynergen (ergotamine tartrate), which paralyzes the sympathetic nerves, are compared. If the blood-sugar curve after the adrenalin injection continues to rise after sixty minutes, and the hyperglycemia induced by the ingestion of glucose also increases, and if, when insulin is not given, the blood sugar rises even though gynergen is injected, the diabetes is of pancreatic origin and is not influenced by paralysis of the sympathetic. In such cases the gangrene is secondary to the hypergly-

cemia and is not primarily of sympathetic origin. In cases in which the blood sugar either continues to increase or shows no marked increase after the injection of adrenalin, but the hyperglycemia induced by glucose ingestion falls to normal levels within thirty to sixty minutes and the injection of gynergen with or without insulin has no effect on the blood-sugar level, the diabetes and the diabetic gangrene are of adrenosympathetic origin because of primary adrenal hyperfunction; the excess adrenalin neutralizes the pancreatic insulin and overstimulates the sympathetic nerves, with the production of gangrene. In such cases unilateral adrenalectomy not only results in healing of the gangrene, but may also relieve the hyperglycemia (unless there is also a pancreatic deficiency).

In 2 illustrative cases reported in which the clinical tests indicated that the diabetes was of pancreatic origin and that adrenalectomy was contraindicated, the patient died (in one case from an intercurrent infection, in the other from the diabetes); autopsy showed the islands of Langerhans to be severely damaged. Of 3 cases in which unilateral adrenalectomy was done, 2 have been entirely cured, the gangrenous area has healed, and the blood sugar has been brought to a permanently normal level without insulin; in one of these cases three years have elapsed since the operation, in the other case only a year. In the third case, the tests indicated some degree of pancreatic insufficiency as a factor in the diabetes; the adrenalectomy in this case resulted in healing of the gangrenous area and in lowering of the blood sugar, but not in complete cure.

ALICE M. MEYERS.

Rappert, E.: The Treatment of Fat Embolism (Ueber die Behandlung der Fettembolie). *Therap. d. Gegenw., Wien*, 1939, 80: 352.

Fat embolism occurs after multiple fractures of the bones and crushing injuries in very fat individuals. It usually occurs in the lesser circulation and smaller vessels, and will clog the pulmonary capillaries. In other cases it also breaks into the major circulation and will clog the capillaries of the brain and kidneys. It is rather peculiar that it does not occur immediately after the injury but rather after a free interval. Dyspnea, cyanosis, wax-like pallor, somnolence, loss of consciousness, convulsions (fat embolism of the brain), oliguria, anuria (fat embolism of the kidney) will follow. It is not true that when a patient has survived the first attack he is through with the disease. Recurrences are frequent. The physician must be on the alert and at least think of fat embolism in cases such as those described. As he is dealing with the fact that large oil globules block the vessels he must break the globules up into smaller particles. For this purpose the author has employed decholin with good results.

At his clinic he saw 69 severe cases. Forty-nine patients were not treated and of these only 1 survived. Of the 20 patients treated with decholin 7 survived. Of those properly treated only 2 failed to respond to the treatment and died. Five patients were treated poorly at the beginning. Six patients in whom the disease was not completely cured died of severe anemia. Of the 7 patients cured 2 died of sepsis within ten or fifteen days. Autopsy revealed only a very few small fat globules in a few lung capillaries. It is evident, therefore, that something can be accomplished with this treatment.

With regard to the technique of the treatment, there should be absolute rest in bed, and no fracture setting. In severe pain morphine should be administered. Coramine should be given for respiratory stimulation. Intravenous infusion is given by the drop method and 10 c.cm. of a 20 per cent solution of decholin are slowly injected into the rubber tubing so that the patient does not vomit. The result is striking. To prolong the action, from 20 to 40 additional c.cm. are added to the intravenous solution as well as coramine. This prompt action is likewise a good diagnostic proof that fat embolism was present. One must, however, continue to give 10 c.cm. of the decholin solution every two hours and smaller amounts on the following days.

In the majority of the cases, however, the treatment is not so simple. The decholin treatment alone is not sufficient in many instances. Eupaverin, 1 or 2 ampoules, should be given slowly intravenously and 2 ampoules intramuscularly for a prolonged effect. Decholin and coramine are continued simultaneously. Eupaverin alone cannot be given as it may lead to cerebral fat embolism. In kidney embolism prolonged diathermy of the kidneys and something for dilatation of the kidney vessels, such as caffeine or euphyllin which must be injected with considerable care, should be employed.

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